



# THE LOWER ATHABASKA AND SLAVE RIVER DISTRICT

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**A** synopsis of all available and useful information of the district lying in the valleys of the Lower Athabaska and Slave rivers from McMurray north to the Great Slave lake. The sections on Agriculture, Fisheries, Minerals, Forests, Water Powers and Game have been prepared or revised by officials of the Departments of Agriculture, Marine and Fisheries, and Mines, and by the Forestry, Dominion Water Power and Dominion Parks Branches of the Department of the Interior, to whom the thanks of the Branch are extended

DEPARTMENT OF THE INTERIOR  
CANADA

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## LOWER ATHABASKA AND SLAVE RIVER DISTRICT

### THE ATHABASKA TRAIL

My life is gliding downwards; it speeds swifter to the day  
When it shoots the last dark cañon to the Plains of Far away,  
But while its stream is running through the years that are to be,  
The mighty voice of Canada will ever call to me.  
I shall hear the roar of waters where the rapids foam and tear,  
I shall smell the virgin upland with its balsam-laden air,  
And shall dream that I am riding down the winding woody vale,  
With the packer and the packhorse on the Athabaska Trail.

I have passed the warden cities at the Eastern water-gate,  
Where the hero and the martyr laid the corner-stone of state.  
The habitant, *coureurs-des-bois*, and hardy *voyageur*,  
Where lives a breed more strong at need to venture or endure?  
I have seen the gorge of Erie where the roaring waters run,  
I have crossed the Inland Ocean, lying golden in the sun,  
But the last and best and sweetest is the ride by hill and dale,  
With the packer and the packhorse on the Athabaska Trail.

I'll dream again of fields of grain that stretch from sky to sky,  
And the little prairie hamlets where the cars go roaring by,  
Wooden hamlets as I saw them—noble cities still to be—  
To girdle stately Canada with gems from sea to sea;  
Mother of a mighty manhood, Land of glamour and of hope,  
From the eastward sea-swept Islands to the sunny Western slope,  
Ever more my heart is with you, ever more till life shall fail,  
I'll be out with pack and packer on the Athabaska Trail.

ARTHUR CONAN DOYLE.

Jasper Park, June 18, 1914.

### AREA AND LOCATION

The area described in this pamphlet extends from McMurray north to Great Slave lake and from the eastern end of lake Athabaska west to the source of the Mackenzie. It includes Athabaska river valley below McMurray, and its main tributary the Clearwater, lake Athabaska, Slave river, and Great Slave lake. Although the extent of this area is about 100,000 square miles, or almost as large as the kingdom of Italy, very little is known about it except the portions in the proximity of the waterways, which form the principal means of communication and travel.

### HISTORICAL DESCRIPTION

The earliest explorer to reach the district was Samuel Hearne of the Hudson's Bay Company in 1770-2. He travelled up Thelon river and explored the Coppermine to its mouth. He then returned southerly, up Slave river for some distance, and easterly across country to Hudson bay.

The first white man to appear on Athabaska river was Peter Pond. He crossed from the headwaters of Churchill river to Clearwater in 1778 and thence down the Athabaska. In the same year Fort Chipewyan (now called Chipewyan) was built on the south shore of lake Athabaska on what is now known as Old Fort point. It

was from this point that Alexander Mackenzie set out in 1780 on his exploration of the river which bears his name. In 1786 Peter Pond sent two men to build a fort at the mouth of Slave river on the shore of Great Slave lake.

A survey of Athabaska river was made by David Thompson in 1804 from its mouth to McMurray and in 1810 he made an exploration of the upper portion of the river.

### GEOGRAPHICAL DESCRIPTION

The general slope of this area is towards the north, and Athabaska, Slave, and Mackenzie rivers form almost one continuous river with Great Slave and Athabaska lakes as expansions or reservoirs which regulate the flow.

Athabaska river has a length of 765 miles and drains an area of 58,900 square miles, equal to that of England and Wales. It rises on the eastern slope of the Rocky mountains near latitude  $52^{\circ} 30'$ . About 85 miles above McMurray at Grand rapids the river falls 50 or 60 feet in about half a mile. Rough water for two or three miles is followed by 20 miles of smooth water to Burnt rapids. Scows must be run down Grand rapids empty and the loads portaged, but Burnt rapids can be run by experienced boatmen with loaded scows. Several more small rapids occur before reaching McMurray where the Clearwater, the Athabaska's largest tributary, joins it. The Clearwater is navigable for about 50 miles by boats drawing not more than four feet of water.

At McMurray Athabaska river has an elevation of over 800 feet, and the banks are 400 feet high. Farther down the rapids entirely disappear, the river widens to half a mile and the banks gradually decrease to almost water level at lake Athabaska. The river enters its delta about 35 miles from the lake and divides into several branches whose channels are constantly changing as the result of the sediment and other material carried down stream. The word "Athabaska" is the Cree for "Where there are reeds," referring to the delta at its mouth. The distance from McMurray to lake Athabaska is 175 miles and the only drawbacks to steamboat navigation are the sandbars and shifting of the channel at the outlet.

Athabaska is the most southerly of the great lakes of the Mackenzie basin. It is a long and comparatively narrow sheet of water extending in an east-northeasterly direction for 195 miles. Its greatest width is about 35 miles, the shore line 520 miles and its area approximately 2,900 square miles. The surface is nearly 700 feet above sea-level but the depth of the lake has never been determined.

The divide between lakes Athabaska and Great Slave lies only a few miles north of the former and as the rocky hills along the central part on the north side are over 800 feet above the lake, the rivers flowing from the north are small and unnavigable. The streams flowing into the lake from the south are also small and unnavigable except Old Fort river. The shore at the western end of the lake is low, only a few feet above the water level, and it is probable that Claire and Mamawi lakes once formed part of lake Athabaska. The deltas of Peace and Athabaska rivers which have been formed by extensive alluvial deposits confirm this theory. Quatre Fourches channel generally drains lakes Mamawi and Claire into Peace river, but during June and July, when the water in Peace river is high, the current reverses in Quatre Fourches channel and flows into the three lakes Claire, Mamawi and Athabaska by numerous channels. Should Peace river be unusually high the water also flows into lake Athabaska through Rocher river which is the outlet of lake Athabaska. When Peace river subsides the Quatre Fourches and Rocher rivers reverse and as it continues to subside the current in Rocher river becomes so swift that only high power boats can ascend it. Other boats ascend Quatre Fourches channel from the Slave and Peace to lake Athabaska.

Mamawi lake is shallow with weeds growing to the surface. Its shores are marshy and the muskeg extends for some distance from the lake before solid ground is reached. At no place except near the intake or outlet was the water over five feet deep.

The shores of lake Claire are generally solid and of a peaty formation, and hay grows abundantly all around. Numerous old backwaters, sometimes four or five miles long, are frequent and sloughs with marshy edges are found in the immediate vicinity of the lake.

Sedimentary action is constantly going on in Claire and Mamawi lakes, and in the western end of lake Athabaska. So much detrital matter is carried down by Peace and Athabaska rivers that their waters are continually turbid.

Slave river connects Peace river with Great Slave lake. The portion joining lake Athabaska to Peace river, known as Rocher river is thirty miles long, but it is in reality a part of Slave river. The total length of Slave river proper is three hundred miles; its width is nearly half a mile and the current averages three or four miles per hour. The average depth is about twenty-seven feet but above the rapids at Fitzgerald places over one hundred feet deep have been found. The rapids above Fort Smith extend over a distance of sixteen miles with a total fall of about one hundred and twenty-five feet, necessitating the portaging of scows and goods. One of the rapids, "Rapides des Noyés" was so called because in 1786 five men were drowned and two canoes lost in it. Another rapid is called "Pelican" as a small island adjoining has been a nesting place of pelicans for many years; Alexander Mackenzie speaks of them in his account of exploration in 1789. There are several other rapids above Fort Smith, the head of navigation for steamers running in Mackenzie waters. If locks could be constructed there permitting steamers to surmount the rapids, boats of four-foot draft leaving the end of the railway at McMurray could descend the river to the Arctic ocean, a run of 1,630 miles.

In places Slave river meanders widely forming bends of several miles which are only a few hundred yards across. At "Le Grand Détour" it flows fifteen miles around a big point across which the portage is only 1,000 yards.

Below Fort Smith the river flows between banks of sand or clay of alluvial formation and enters Great Slave lake by many channels through a delta of low alluvial islands. This delta is about twenty miles wide and is gradually being pushed out into the lake, threatening to cut off the western end of the lake from the northern and eastern arms.

The lake has an area of about 12,000 square miles and ranks fourth on the continent, only Superior, Huron, and Michigan being larger. No complete survey of the lake has ever been made but its length is estimated at 288 miles and its greatest width 60 miles. The bed of Slave river at one time formed an arm of Great Slave lake, but this arm has become filled with silt carried down by the river. The eastern and northern arms of the lake contain clear fresh water and are probably deep, but the western end is shallow and the water very turbid.

## MINERALS\*

The principal minerals at present known to exist in the Lower Athabaska and Slave river district are very limited consisting only of salt, gypsum, oil and gas. Development of these has made little progress owing to the distance from a market and lack of suitable transportation.

What metalliferous ores have been discovered in the vicinity of Great Slave lake include gold, silver, copper, zinc and lead, but difficulties of transportation, remoteness of a metal market, to say nothing of the absence of a local supply of labour would put mining operations out of the question unless the deposits of the precious metals were extraordinarily rich.

A carload of modern cyanide mining machinery has been shipped to Caribou island in Great Slave lake where a number of gold mining claims have been staked. Prospecting on a small scale has been going on there for two or three years but the

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\* Revised by the Department of Mines, Ottawa  
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rock is so hard that progress is slow, the greatest depth yet attained on any of the claims being about twelve feet. The difficulty of securing suitable fuel is also hindering operations. Sufficient progress has not yet been made to determine the value of the property, but after the new machinery is installed by the twelve experienced miners accompanying it better progress will show whether gold mining can be profitably carried on there. Galena and zinc blende occur about twenty-seven miles south-west of Resolution and nine miles inland from Great Slave lake. Deposits are small and disconnected consisting of coarse galena, light coloured zinc blende and some iron pyrites. Claims have been staked there and shallow pits sunk last year by an eastern Canadian syndicate. It is reported that an experienced mining crew will be sent in this (1921) season and operations started on a fairly large scale.

Hematite is also found on the north side of lake Athabaska and on Moose and Dugout (Steeptank) rivers, tributaries of the Athabaska. Some nickeliferous sulphides are found at the eastern end of lake Athabaska and a number of claims have been staked.

Salt is generally regarded as an article of little commercial value, intrinsically, but the lack of it soon determines its necessity. Its chief uses are for the preservation of meats, fish, butter and hides; in the manufacture of hydrochloric acid and other chemicals required in many industries; glazing drain tile; refrigeration; and in certain metallurgical processes.

Of the above, the only use made of salt in northern Alberta is the first and the supply is obtained with little difficulty on Salt river, which empties into Slave river sixteen miles north of Fort Smith. The salt springs are located about twenty miles from Slave river where the water issues from the base of a long even ridge 200 feet high, and spreading over an extensive clayey plain, deposits a considerable quantity of common salt, in large cubical crystals. Most of the salt used throughout this northern country is obtained there. Petitot states that when Peter Pond visited the district in 1780 he discovered a half-breed named Beaulieu settled on Salt river and some of his descendants have occupied the locality ever since. At one time Beaulieu collected royalty on the salt deposits (of which he claimed the proprietorship) from all the northern people who secured their supply from the district, but the discovery of other salt springs farther up the river by an employee of the Hudson's Bay Co. put an end to his acquiring further revenue.

At present a very large area is covered to a considerable depth by these salt deposits, many of the hillocks being 15 feet in diameter and 2 feet deep. No attempt has been made to ascertain the amount of salt as the lack of a ready market prevents development of any magnitude.

At McMurray, the located terminus of the Alberta and Great Waterways railway, a salt deposit has been found which will probably prove of great value in the immediate future as all salt at present being used in central Alberta is imported for some distance and at considerable cost owing to the high freight rates prevailing. The McMurray salt deposit is reported to consist of two layers each nearly 100 feet thick at depths of 600 and 750 feet. The extent of the supply has not yet been ascertained, but the thickness of the deposit would certainly indicate a large area. Facilities for shipment will be good as the railway will soon be constructed to McMurray, and Edmonton, the other terminus of the line, is already a great distributing centre.

### Petroleum

There are two geological formations in Alberta and the Northwest Territories which contain oil,—the Cretaceous and the Devonian. Each of these formations is several thousand feet thick. Throughout almost the whole of Alberta the Cretaceous formation is at the surface, while the Devonian, which is very much older, lies at a great depth beneath.

In the Northwest Territories, however, around Great Slave lake and along the Mackenzie the Crutaceous beds have been worn away and the Devonian formation is in sight; it is on this latter formation that the oil prospects depend in these regions.

The Devonian rocks form cliffs in several places at the western end of Great Slave lake and in some places there are considerable showings of oil. Much of the coast is so low and swampy that there are not sufficient exposures for the structure to be clearly determined but it is evident that the beds undulate in gentle folds. The largest seepages of oil are on the north shore in the vicinity of Windy point where the cavities of a bed of crystalline dolomite limestone contain a light yellow oil. Where this bed crops out under the water there is much oil rising to the surface, and where it crops out on the land there are many small pools of oil. This oil is thick and dark, being only the residue left after evaporation of the light constituents.

The analysis of a sample of this oil collected by Mr. Camsell of the Department of Mines in 1910 gave the following results:—

Specific gravity crude oil at 15.5° C., 0.957.

Preliminary distillation of 203.7 grams crude gave 122.2 grams oil distillate of 0.888 sp. gravity. This is 60 per cent by weight or 64.5 per cent by volume of the crude oil.

Fractional distillation, Engler apparatus, of 100 c.c. oil distillate taken gave 1st drop at 178° C., at 178° to 300° C. gave illuminating oil, etc., 23 per cent by volume, 0.855 sp. gravity, equivalent to 14.9 per cent by volume crude oil.

Residue, lubricating oils, etc., 77.0 per cent by volume, equivalent to 49.6 per cent by volume of crude oil.

Calorific value of crude oil, 10,040 gram calories, 18,070 B.T.U. per pound.

Sulphur in crude oil, 1.0 per cent.

At the present time (July, 1921) considerable interest is being taken in the possibility of obtaining oil in commercial quantities at Windy point on the north shore of Great Slave lake. At this place a number of oil seepages occur from the Presquile formation of Middle Devonian age. The Presquile formation is a porous dolomite containing caverns lined with dolomite crystals and partly filled with a thick heavy oil. Where fractures have occurred in the rock or where other factors have tended to concentrate the oil, small pools occur on the surface and where such seepages occur under the lake, the surface of the water is almost constantly covered by a thin film of oil. A black, viscous substance, derived from the oil, stains the face of the rock and on a warm day, dark streaks of an oily mixture ooze out of the rock and slowly run down over the edges of the exposures. There is no doubt that this horizon contains oil in quantity but the outcrop of an oil horizon cannot be expected to be a very favourable location from which to obtain commercial quantities of oil by drilling. This is especially true of Windy point because the thickness of the Presquile formation is nowhere in this general locality more than a few hundred (100-300) feet at most and at Windy point the upper, or *Stringocephalus burtoni* zone, appears to be lacking.

Below the Presquile formation there is the Pine Point series of limestones and limy shales. In places, these are bituminous, especially on the south shore of the lake, but on the north shore, from exposures seen just west of the North Arm, nothing was discovered to indicate that this formation might contain oil in commercial quantities.

The possibilities of finding oil at some distance inland from Windy point are unknown. From what is known of the regional structure, the Windy point anticline is a local fold on a much larger southwestward dipping structure. If this is the case higher beds than the Presquile formation ought to be found at some distance inland from Windy point. The formation immediately above the Presquile is the Slave Point formation mostly of limestones and above this is the lowest member of the Upper Devonian series—the Simpson shale. If favourable structures can be located in this region with a cover of Simpson shale, the possibilities of finding oil would seem to be very good. At present very little or nothing is known of the country

inland from Windy point so that it is not known how far back it would be necessary to go before the Simpson shale would be found, but the character of Big island in Mackenzie river and the portion of the main land immediately northwest of it suggest it is underlain by Simpson shale. Below the Devonian, the Silurian red beds will be encountered and oil cannot be expected to be found in these.

In connection with Windy point, the sulphur springs of Sulphur bay ought to be considered. At Sulphur bay there is a small flood flat in proximity to outcrops of Presquile dolomite. Issuing from these dolomites are a number of small springs of sulphur water which are depositing gypsum and pure sulphur. The fetid odour of hydrogen sulphide is very pronounced in the vicinity and the water of Sulphur bay is a dirty milky white colour, due presumably to sulphur in suspension.

It is known from various oil fields that sulphate waters are not found in close association with oil. In the Sunset-Midway oil field of California, according to Rogers of the United States Geological Survey, there is a great amount of sulphate in the surface water but none in connection with the oil horizons. The water associated with the oil field, on the other hand, shows the presence of alkali carbonate which is absent in the shallower waters where sulphate is present. The intermediate zone between the sulphate and carbonate zones shows the presence of hydrogen sulphide. It is, therefore, thought that the sulphate is reduced to sulphide by the chemical reaction of certain constituents in the oil and that oxidation conditions bring about the deposition of sulphur which is found in considerable quantities at some places in the Sunset-Midway field.

An analysis of one specimen of salt collected at Sulphur bay showed that it was composed principally of gypsum with some small amount of sulphur, whereas another sample collected only a few feet distant from the first showed 72 per cent of sulphur and the remainder of gypsum, small pebbles, and a little organic matter. The report given by the Mineralogical Department is as follows:—

"Some of the little lumps of sulphur are almost pure, others are intimately associated with much gypsum. The sulphur appears to have resulted from the reduction of gypsum."

It is known that the Silurian beds at the south end of the North Arm contain gypsum in quantity at certain horizons. Also, it is thought that the general regional dip is to the west or slightly south of west. This being the case, the conditions at Windy point would be such that water at any horizon in the under-lying Silurian would be under a hydrostatic head and hence, if opportunity were given, would be expected to come from such depths carrying gypsum in solution. In passing up to the surface such gypsum-bearing waters would pass through the Presquile formation in which oil is present and hence it would reasonably be supposed that a reaction between the gypsum and certain constituents might readily take place resulting in the reduction of gypsum and the formation of hydrogen sulphide. The fact that gypsum is deposited on the surface from such solutions shows that the reduction is not complete. This may be because the amount of gypsum is in excess of the amount with which the reducing agent is able to react or simply because the gypsum-bearing solutions come in contact with the oil only in the upper horizon, and sufficient time is not given for the complete reduction of all the gypsum. Around Sulphur bay the number of sulphur springs represents a considerable amount of sulphur, although no great quantity is to be found in any one. All these springs are from the Presquile formation and as the action of sulphate water lowers the quality of oil, the specific gravity of any oil near here is likely to be heavy if it has come in contact with the sulphate solutions.

A possible explanation of the oil seepages at Windy point is that the sulphur-bearing waters rising from below carry considerable quantities of calcium and magnesium salts and, percolating through the overlying thin-bedded limestones, change them to crystalline magnesian limestones and dolomites. In the process the

bitumen is set free and forced either into the cavities formed in the dolomites or through the fissures, developed during dolomitization, to the surface to form the tar and oil pools.

The field facts upholding this explanation are:—

1. That certain portions of the beds are not yet completely changed to dolomite but are made up of a coarsely crystalline white dolomite mixed with a more finely crystallized dark brown bituminous magnesian limestone. No distinct line of separation exists between the two phases but there is a gradation of one into the other.

2. In places the outlines of fossil remnants are distinctly visible. In the neighbourhood of Sulphur bay, to the north of Windy point, similar dolomites occur and there distinct fossils are numerous, though they show a partial recrystallization into curved rhombohedral crystals of dolomite.

3. A partial qualitative analysis of silt incrustations from the vicinity of one of the large sulphur springs in Sulphur bay gave abundant sulphate and carbonate salts, principally of calcium but with an appreciable amount of magnesium.

4. No natural gas accompanies the oil.

The thickness and character of the underlying strata will be known when the well now (July, 1921) being drilled at this point by the Imperial Oil Company is completed.

The anticline which contains the oil indications at Windy point crosses the lake to Pine point on the south shore and prospecting for oil at this place is becoming active. This field promises to be the centre of activity around Great Slave lake on account of its advantages both geologically and geographically as it is the closest field to the end of transportation by rail and could be easily reached by railway or pipe line without crossing any rivers.

### **Bituminous Sands**

As a result of field and laboratory work in connection with the investigation of the bituminous sands of the McMurray district, northern Alberta, a large amount of data is now available. The following statement by Mr. S. C. Ellis of the Mines Branch, Department of Mines, constitutes a very brief summary of the results of the above work:—

An extensive deposit of bituminous sand—commonly though incorrectly referred to as 'tar sand'—outcrops at frequent intervals along the Athabaska river and certain of its tributaries through an aggregate distance of approximately 200 miles, in the district centering about McMurray. Unfortunately a great deal of misconception regarding this deposit has arisen through incorrect statements by uninformed people.

The area represented by outcrops and presumably underlain by bituminous sand, may be arbitrarily defined as lying between W. long. 110° and 113° and between N. lat. 56° and 58°. All exposures within this area lie within a radius of 60 miles of McMurray. Upwards of 250 exposures, all of which represent portions of one continuous deposit, have been examined and measured. The direct distance in a north and south direction through which outcrops have been noted, is approximately 110 miles, and that from east to west approximately 80 miles.

Certain of the above outcrops represent portions of a deposit that, with reasonably favourable market and transportation conditions, will eventually prove commercially valuable. But it is also true that the greater portion of

the area underlain by bituminous sand, cannot be considered as of any present economic value. This statement is based on a consideration of controlling factors such as thickness and character of overburden, transportation, percentage of associated bitumen and uniformity of material.

Each of these factors should be given careful and detailed study in considering commercial development in any portion of the McMurray district. Other important, though subsidiary, factors are fuel and water supply.

Associated with the bituminous sand, are occasional small seepages of bitumen, which originate in the richer beds, and are locally known as 'tar springs'. None of these is of sufficient extent to be considered of economic importance.

The outstanding features presented by the McMurray deposit may be briefly stated as follows:—

1. That the deposit represents the largest known occurrence of solid asphaltic material.
2. That the deposit is, as yet, totally undeveloped.
3. That at the present time practically all asphaltic materials used in Canada are imported from foreign countries.

Three possible lines along which the bituminous sand may be commercially developed, are suggested:—

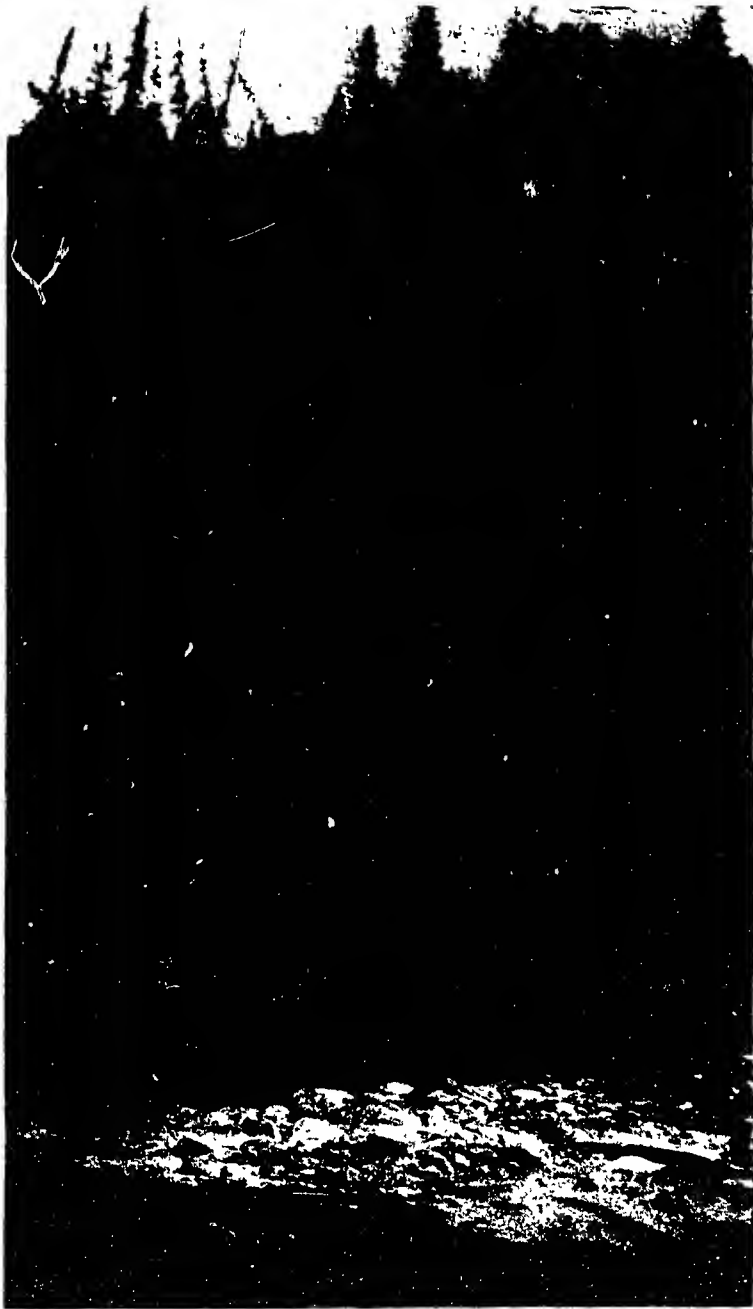
1. That the crude material be used in the surfacing of streets and highways. In 1915, in order to demonstrate the merits of the material, the writer designed and laid in Edmonton, Alberta, areas of standard sheet asphalt, bitulithic and bituminous concrete. This effort marked the first attempt to commercially utilize the bituminous sand as a paving material and the result was entirely satisfactory. The extent to which the crude material may be used for such purposes will be largely determined by freight charges. In competition with imported asphalts—which at present (1920) sell for \$40 per ton at Edmonton—the permissible freight haul will be limited to about 600 miles.
2. That the bitumen, which is of a high grade, be separated from the sand aggregate, and utilized for a number of recognized purposes for which such material is well adapted.

The results of the writer's research work in connection with the separation problem, although encouraging, are as yet not conclusive.

3. That the crude bituminous sand be retorted with a recovery of crude petroleum. Such a distillation has been made, using a retort with a capacity of 25 pounds crude bituminous sand. The crude petroleum derived in this manner was then fractionally distilled and the various distillates refined. Possibilities of such distillation on a commercial scale have yet to be determined, but there are strong indications that the associated hydrocarbons can be successfully recovered from the bituminous sand in this manner.

Apart from the laboratory work that has been completed, field work has included the measurement of practically all outcrops and extensive sampling throughout a large part of the area. As a result of this work, it is now possible to indicate those portions of the deposit which possess commercial possibilities, as well as the approximate acreage available in many instances. Detailed topographical maps of a large portion of the area have been completed on which thickness of bituminous sand and of overburden is indicated.

In May, 1912, the privilege of filing on bituminous sand claims was withdrawn by Order in Council. Although prior to that date many claims had been recorded, the titles of most of these have since lapsed. At the present time, apart from two small government reserves, apparently not more than nine such claims are in good standing.



#### BITUMINOUS SAND

Exposure on north bank of Dugout (Steenbank) river, about  $3\frac{1}{2}$  miles from its mouth, illustrating typical massive structure and cleavage common to high grade deposits of bituminous sand.

For the sake of convenience and handy reference a synopsis is given of petroleum and gas regulations in the Northwest Territories, and also a synopsis of provincial legislation and regulations governing sale of shares, stocks, bonds, etc.

*Synopsis of the Regulations in force on June 15, 1921, for the Issue of Oil and Gas Permits and Leases in the Northwest Territories of Canada*

Oil and gas rights, the property of the Crown, in the Northwest Territories of Canada, may be acquired under permit by a person eighteen years of age or over, or by a company. The regulations under which such rights may be acquired are established by Orders in Council, copies of which may be obtained on application to the Mining Lands and Yukon Branch of the Department of the Interior.

The maximum area of an oil and gas location is 2,560 acres, or four square miles, and the minimum area is eighty acres, subject to the grouping provisions contained in the regulations and referred to herein. A location must be rectangular in shape, the length not to exceed four times the average breadth. It must be staked out along its greatest dimension by the applicant in person, and personal application for a permit must be made to the mining recorder for the district, or to a sub-recorder, within thirty days after staking, unless the location is distant more than one hundred miles from the office of such recorder or sub-recorder.

The term of the permit is four years, and application for such permit must be accompanied by a fee of five dollars, and the rental for the first year at the rate of fifty cents an acre. If drilling equipment is installed during the first year and evidence furnished, the rental for the second year, at the rate of one dollar an acre, will not be required, and if drilling operations are commenced and continued prior to the beginning of the third year, payment of the rental for that year at the rate of one dollar an acre will not be necessary.

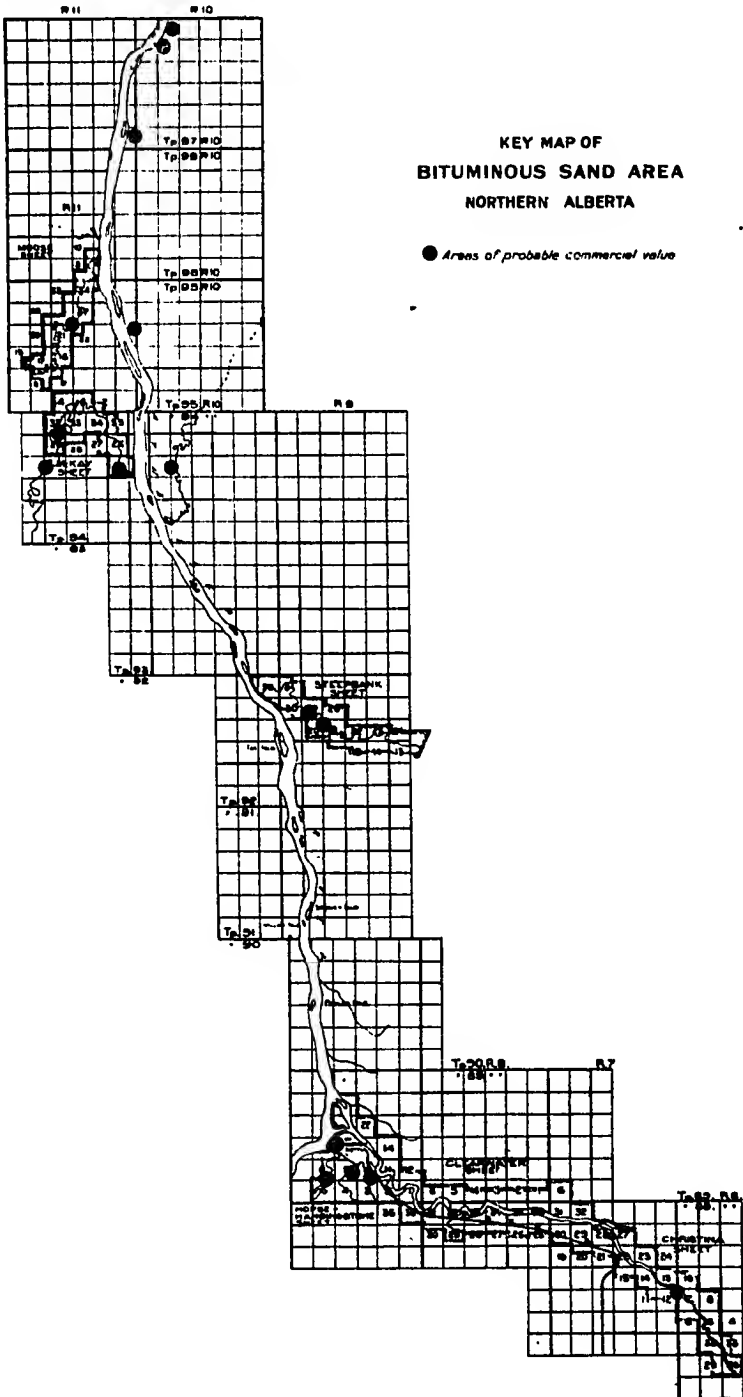
Within two years from the date of the permit a complete drilling outfit must be installed on the location and evidence furnished, otherwise the permit will lapse after the expiration of ninety days from the date of such notice requiring the default to be remedied, without any declaration of cancellation. During the third year one or more wells must be drilled to a depth of at least five hundred feet, and during the fourth year one or more wells must be drilled to an aggregate depth of two thousand feet. If oil in commercial quantity is discovered at any time during the four years, the permit shall terminate and the permittee shall be entitled to receive a lease for a term of twenty-one years, renewable, comprising one-quarter of the location, selected in a square block. Should it be decided to dispose of the remaining three-quarters the original holder of the permit shall have first option to acquire same at an amount equal to 95 per cent of the highest offer made by any responsible bidder in cash, excess royalty, or both, provided the amount to be paid to the Crown is not less than the amount of the upset valuation fixed.

The Minister may allow a permittee who has acquired by application, assignment or otherwise more than one oil and gas permit, to consolidate his operations, and upon receipt of evidence that adequate drilling outfits have been installed on one or more of the locations included in the group, may grant an extension of time in which to pay the second year's rental or any subsequent year of the term of the several permits, or the amount, shown to have been expended in drilling operations, exclusive of the cost of machinery and casing, may be applied on account of the rental. The maximum area of the locations which may be included in one consolidation or group shall not exceed twenty square miles, nor shall the locations so included be separated one from the other by a greater distance than two miles.

A royalty of five per cent shall be collected on all oil production up to the 1st of April, 1926, and after that at the rate of ten per cent, and rental at the rate of one dollar an acre per annum.

# KEY MAP OF BITUMINOUS SAND AREA NORTHERN ALBERTA

● Areas of probable commercial value





A company acquiring a lease under the provisions of these regulations shall be a company incorporated under part one of the Companies Act, Chapter 79, R.S.C., 1906, and amendments thereto. Citizens of another country the laws, customs or regulations of which deny similar or like privileges to citizens or corporations of the British Empire, shall not own any interest in any permit or lease acquired under the provisions of the said regulations.

BOARD OF PUBLIC UTILITY COMMISSIONERS FOR THE PROVINCE  
OF ALBERTA

APPLICATION FORM

(For Mining and Oil Companies or Syndicates)

To be Filled up and Sworn to by the Duly Authorized Officer of the  
Applicant Company.

- 1. Registered Name of Company.....
- 2. Head Office (street and town).....
- 3. Class of Mineral.....
- 4. Geographical Location of Property (describe fully).....
- 5. Give any additional description of claims.....
- 6. Class of Title (leases, or Crown grants, etc).....
- 7. Total Annual Mineral Rentals or Assessments in respect of Claims \$.....
- 8. Capital (nominal) \$.....in shares of \$.....each.
- 9. Capital (issued) \$.....in shares of \$.....each.
- 10. Actual Cash received for shares already issued \$.....
- 11. Present application is for power to sell.....shares at a price of \$.....per share.
- 12. Is any consideration involved other than cash?.....
- 13. If so, what? (Give full details of property and services).....
- 14. What commission is proposed to be paid?.....%
- 15. Are sales to be made by:—(1) Advertisement?.....
- 16. For what purpose is fresh capital required?.....
- 17. Are any contracts pending?.....(If so attach copies).
- 18. Has the property been valued by an Engineer who has not, nor has had, any interest in the Syndicate or Company?.....
- 19. If so, by whom?.....(attach copy of his report).
- 20. State names of Directors:—

Name	Shares taken	Consideration for which shares issued.
.....	.....	.....
.....	.....	.....
.....	.....	.....
.....	.....	.....
.....	.....	.....

The Board will, in addition to the form enclosed, require upon the application, the following:—

- (1) A copy of the Company's prospectus, in conformity with section 56 of Alberta Companies' Ordinance.
- (2) A copy of the Company's By-laws.
- (3) A copy of the contract for shares to be entered into between the Company and the proposed subscribers. This form must comply with the requirements of Section 11 of the Sale of Shares Act as amended by the 1917 Statutes.
- (4) An itemized account of the Company's financial condition, showing the Company's property, assets, and liabilities, the total amount of cash received from the time of the organization of the Company, the expenditure, and generally a full financial statement of the Company's affairs.

- (5) The filing fee, which depends upon the amount of the issue sought to be authorized. A tariff of the fees chargeable is herewith enclosed.
- (6) The Board will also require full information as to the number of shares sold by the Company.
- (7) All documents must be verified under oath by a duly authorized officer of the Company.

\*SYNOPSIS OF PROVINCIAL LEGISLATION AND REGULATIONS GOVERNING THE SALE OF STOCKS, BONDS, ETC.

### *The Sale of Shares Act*

The Sale of Shares Act, Chapter 8, Statutes of Alberta 1916, renders it unlawful for any person, company, or any agent acting on his, its or their behalf, to sell or offer to sell or attempt to sell in the Province of Alberta, any shares, stocks, bonds or other securities of any company, corporation, syndicate or association of persons without first obtaining from the Board of Public Utility Commissioners a certificate permitting the sale of such shares, stock or other securities.

Any agent soliciting subscription for stocks, shares or other securities in a company is also required to obtain from the Board a license which is renewable each year. This license must be produced by the agent in every case where he solicits subscriptions for or offers to sell shares of stock in any company, etc. The license is not a general license to sell stock or shares but only a license to sell the stock or shares in some particular company which has already obtained a certificate from the Board.

In order to obtain a certificate permitting it to sell shares within the Province, any company, corporation, syndicate, or association of persons desiring to sell its shares within the Province, is required to file with the Board a statement showing in detail the plan upon which the company proposes to transact business, a copy of its charter or certificate of incorporation, articles of incorporation, an itemized account of its financial condition and other material as set out in the Act or as may be required by the Board.

Before issuing the certificate, the Board requires to be satisfied that the company's plan of business is fair, just and equitable.

The Act does not cover the sale of Government or Municipal stocks, debentures, etc., or securities listed upon any stock exchange that has been approved of by the Board for such purpose. Isolated sales of one's own stock or shares also do not come within the Act, but the publication or advertisement in any newspaper, magazine or other periodical or the issue or distribution of any advertisement or circular containing an offer to sell or intimation of the fact of the issue of any such shares or other securities, or solicitation by agents or employees, is to be deemed evidence of an attempt to sell in violation of the provisions of the Act.

Heavy penalties are provided in case of the violation of the provisions of the Act. Copies of the Act with the amendments, together with a synopsis thereof, can be obtained on application to the Secretary of the Board.

## CLIMATOLOGY

The development of the western provinces has been from the prairie country of the south to the brush and park country of the north, settlement following the two great waterways, Peace and Athabaska rivers.

The line marking the northerly limit of present development conforms with the boundaries of climatic zones, and consequently with forest cover; it also conforms with several geological conditions which are important factors in determining the agricultural and economic possibilities of the country. The northerly deflection of this line in the west has been caused by the tempering influence of the mountains and the

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\* Board of Public Utility Commissioners for the Province of Alberta

southerly deflection in the east by the great inland sea, Hudson bay, into which the ice-laden Arctic waters have free access, and from which there is no mountainous barrier to the level sweep of the cold air currents.

During the glacial period the ice from the northeast stripped off the soil and softer rock, carried them along, grinding and mixing them, and finally deposited them in its retreat. Conditions were thus produced, which were favourable or unfavourable to agriculture, according to the nature of the soil deposited.

Throughout the lower Athabaska area these conditions have been well exemplified by the base lines which have been run extending across the country from east to west every twenty-four miles. These may be considered as cross-sections revealing the profile of this area, the forest cover, the surface conditions, and the nature of the soil.

The climate of a country is a very important factor in determining a place of residence, and a delightful climate will make up for numerous other drawbacks. By a delightful climate is meant not necessarily a warm climate but one free from sudden fluctuations. The most vigorous and intelligent of the human races are those living in climates where the heat is not sufficient to render them torpid and lazy and where the cold weather is not so severe and lasting as to require all their time providing the necessities of life.

While the climate of northern Alberta may not be ideal in this respect it does possess many of the characteristics of a delightful climate. When the weather turns cold in the fall it remains cold until the following spring, and wind storms during this period are rare. In summer the days are warm, but the nights even in the hottest periods are cool and refreshing. This tends to produce vigorous growth in both the animal and vegetable world, and as the daylight in summer in high latitudes is very long plants mature in a very short time. This is an important provision of nature, as hardy plants are enabled to reach maturity before being damaged by early frost.

The fur-bearing animals of northern Alberta are also furnished by nature with a heavy coat as a protection against the cold winter, which renders the fur products of this area among the finest in the world, and the flesh of northern fish far surpasses that of those caught in more southerly districts. This is important, as fish and fur constitute the two great sources of revenue of this area and the former is the principal article of diet both in summer and winter.

The climate locally is also tempered to a certain extent by the proximity of bodies of water and this is one reason why settlements are located mostly on their shores. Some of the settlements are located along the large rivers since these latter furnish a ready means of travel from place to place. The numerous rivers and lakes, moreover, furnish a plentiful and permanent supply of the principal article of diet, without which the district would be almost uninhabitable.

Intimately connected with the climate of a region, the data regarding the freezing and breaking up of the rivers and lakes are of interest. As the life of the few white inhabitants north of lake Athabaska is closely bound up with the waterways of the great river system, the opening and closing of navigation on these waterways are the two great seasonal events of the year.

The break up of the ice in spring begins in the small streams. When these are open the increase of water in the main streams arches the ice sheet and finally breaks it up. The broken ice usually jams at some point lower down; the pent-up water behind the jam breaks out again and sweeps the river clear of ice. This operation is repeated until no ice is left in the river.

The formation of an ice jam often leads to rapid and destructive rises in the northern rivers. At the mouth of the Clearwater a rise of about thirty feet caused by an ice jam in the spring of 1919 resulted in the loss of a large quantity of provisions

stored at McMurray. When the ice piles up in a jam the enormous pressure above forces the lower blocks into the mud in the bed of the stream from which they emerge after the pack is swept away. The mud-laden blocks account in a large measure for the alluvial deposits at the mouths of most of the northern rivers, as they are the last to be carried down stream and melt before reaching the lake where the river empties. The ice in the lakes is the last to pass out as there is no force to break it up, that in Great Slave lake not disappearing until the early part of July.

In the fall, navigation is interrupted, before the actual closing of the streams, by drift ice. This is mainly ice which has formed in the bays and which by a slight rise in the water or by the accumulation of snow upon it becomes detached and descends the river. This continues until the increasing cold causes the mass to jam and become solidly cemented. Drift ice is usually encountered in the lower Athabaska and Slave rivers during the first half of October and solid ice about the middle of October. The proximity of lake Athabaska to the treeless area to the east from which cold winds blow frequently keeps its average temperature rather low, but an occasional warm west wind slightly tempers the winter climate. The mouths of the Peace and Athabaska rivers break up about the first of May, but the neighbouring part of the lake does not usually open until the middle of the month, while the easterly portion remains solid till June. The lake closes at Chipewyan for navigation usually in the latter part of October or early in November, and although the centre of the lake remains open much longer, the bays and shore line freeze over and contribute drift ice to all the moving water, thus rendering it unnavigable. Ice forms on the bays in Great Slave lake about the end of October and the whole lake is frozen over between the middle and end of November, the ice attaining a thickness of eight feet. Spring break-up occurs between June 20 and July 10, ice in the western part disappearing earlier than in the eastern.

Around the lake the soil seldom thaws out to a greater depth than eight feet and in many of the muskegs and marshes ice remains throughout the summer at a depth of two feet, the covering of cold water preventing the summer heat from penetrating to any considerable depth.

Sir Frederick Stupart, Director of the Meteorological Service of Canada, in a paper read before the International Geographic Congress stated that the climate of the Mackenzie basin is nearly as warm as that of southern Alberta. In his opinion the Mackenzie basin is a land of great promise but it must be spied out and experiments in agriculture made before any extensive immigration is encouraged. Although the summers are warm the rapid downward trend of the temperature curve is very noticeable after the middle of August and frosts are not uncommon before the end of that month. A slight fall of snow, and perhaps a frost, occasionally occurs late in May after warm summer-like weather but such weather while very disagreeable appears to do no harm to the crops. What is more to be dreaded is a light frost just before the grain is harvested in August; but nearly twenty years of observation show that such frosts are by no means of annual occurrence and when they do occur they are light and local. In the Mackenzie basin the effect of higher latitude and the shortening days is very marked, even in September, in the rapid downward trend of the temperature curve, and winter may be considered set in before the end of October.

#### AGRICULTURE\*

The northern district has been avoided by the land seeker on account of the lack of information as to the nature and possibilities of the country, and the absence of roads by which to investigate it, and also because the land for the most part requires drainage and clearing before it can be used for production. The prairie land in the

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\* Revised by the Department of Agriculture, Ottawa.

southern part of the western provinces has none of these disadvantages, and until this prairie land is taken up little attention will be paid to the settlement of the northern area.

Part of the Athabaska and Slave river district is composed of the Laurentian plateau and part lies in the Great Central plain. The western boundary of the Laurentian plateau runs in almost a straight line from the vicinity of Methy portage to the north arm of Great Slave lake.

On account of its rocky character, the absence of soil, and the low temperature, this district is not generally suited to agriculture and can never be considered as part of Canada's reserve of agricultural lands. Except in a few localities where clay lands occur or where deposits of alluvium have accumulated, no crops of any kind are at present being raised within the limits of this plateau. In such localities are Chipewyan and Fort Smith where excellent crops of vegetables and some of the hardier varieties of grain are grown, but these places lie so close to the border of the Great Central plain as to partake largely of the nature of that region.

The Great Central plain extends from the Laurentian plateau westerly to the foothills of the Rockies, and is fairly well adapted to agriculture. It must not be assumed that the whole of this area is agricultural land, as portions are too high above sea level and other parts are low-lying spruce muskegs incapable of drainage. These cannot be considered as possible agricultural lands.

Along Athabaska river a great deal of the soil is of fair quality. Some small prairie land at McMurray contains good soil, and roots and garden crops are raised which are of very good quality.

The area east of Athabaska river between McMurray on the south and Firebag river to the north, except a narrow fringe along the river, is practically all sand plains and ridges interspersed with muskegs. The greater portion of the sandy area has been burned over and is now growing up with second growth jack-pine.

A large willow flat on the west side of the river east of Birch mountains contains soil of good quality. This flat extends some distance westerly but much of it has been flooded by the action of beavers. Between this flat and the river the surface is level or slightly rolling and is composed of muskegs and sand plains with occasional rolling country.

The soil on the plains is mostly sand and is valueless for agricultural purposes. In the muskegs it is of first class quality and easily cleared, but extensive drainage operations would have to be undertaken before it could be utilized. On the uplands the soil is a light sandy clay covered by a few inches of decayed vegetable matter. This, while gravelly in places, would yield light crops if cleared. Good soil is found in the heavily timbered flats of the river valleys, the largest of which extends up the valley of Firebag river.

"Birch mountains" is the name applied to an extensive elevated area occupying most of the country lying between Athabaska and Wabiskaw river and having for its southern boundary a line approximately between Chipewyan lake and the mouth of Namur river. The boundaries of this area are very irregular and its surface varies greatly in roughness and in the direction of its ridges. A marked feature of this elevated area is the accumulation of boulders at the surface indicating its probable origin as glacial. The rolling surface gives it in general a fair drainage but the soil is light. Good grass grows for about forty miles west of the Athabaska on Birch mountains beyond which it is scarce. Muskegs with intervening sand ridges are numerous and the ridges have been overrun by fire so often that there is no growth of timber of any account. The same conditions prevail on the east side of the river but grass on willow flats is more plentiful. This is due to the streams being more numerous and shallow, and the beavers having constructed dams on them to submerge their houses. These dams are now filled up with silt forming valuable hay and willow flats.

South from the westerly end of lake Athabaska the land is mostly sandy alluvial deposit, being formed by the silt brought down by Athabaska river. It is fairly good for agriculture except that it is low, wet, and liable to flooding unless well drained. Little or no grass grows as a thick coat of pine needles covers the surface which carries a growth of small jack-pine.

The only locality around lake Athabaska where agriculture is carried on is at Chipewyan where some patches of good land between the granite hills produce the ordinary vegetables. West of Slave river the soil is alluvial and very little above the water level in the lake. Some good land is found along Peace river before it enters Slave river and these good patches extend back for about fifty miles from the confluence.



CATTLE ON THE MISSION FARM AT SALT RIVER

The best grazing areas north of Chipewyan lie west of Slave river to Caribou mountains. Besides raising cattle and horses the Mission cultivates a considerable area of land for grain crops.

Farming and ranching operations on a small scale are being undertaken by the Mission at Fort Smith on the salt plains a few miles to the west. An experimental farm is conducted by the Dominion Department of Agriculture at St. Bruno, about twenty miles from Fort Smith, on which excellent crops of oats have been raised. In this region there are several thousand acres of prairie or partly open country covered with a variety of fodder grass making an excellent range for horses or cattle. It originally formed part of the range of the wood buffalo but it is now overrun by the horses of the residents of Fort Smith and Fitzgerald which winter out in the plain, and in summer are used to transport goods over the sixteen mile portage. In 1916 the Mission had about 100 head of cattle and a few horses, and ground had been broken on which a variety of vegetables, barley and oats were successfully grown. Agriculture can be carried on as far north as latitude  $61^{\circ}$  but the variety of crops which can be grown is more limited.

Practically no attention is paid to agriculture along Slave river except at Fitzgerald and Fort Smith, where garden produce is successfully grown. In 1911 a field of oats at Fort Smith showed signs of ripening on July 31 and barley was so far advanced that if cut it would ripen in the shock. Mixed farming would therefore

appear to be possible, but with so much good prairie land available in the southern part of the province, no attempt has been made at extensive cultivation in the northern part.

The soil along the south shore of Great Slave lake is alluvial sandy loam, and all the hardy vegetables are successfully grown. The shore is low with numerous muskegs and swamps and is covered with a mixed growth of spruce and willow of small size. When the muskegs are cleared and drained the moss dies off and the frost comes out of the ground so that it can be cultivated. On a farm at Chipewyan which was originally a muskeg, wheat of first-class quality is raised. This wheat was awarded a medal at the Centennial Exposition.

The southwest shore of Great Slave lake has fair agricultural possibilities. At Hay river and Providence posts barley and all the common vegetables are raised and at the latter place wheat and oats have frequently matured without damage from frost.

The north shore is bold and rocky and gardens are made only by collecting earth, from wherever it may be secured, and spreading it over the rocky surface.

Providence is surrounded by flat arable lands of good quality capable of producing excellent crops, and quantities of farm produce are raised annually. Prelude wheat from seed acclimatized for several years yields a good well-matured crop; it is usually sown about May 15 and ripens in from 90 to 100 days. Marquis wheat, although yielding ten bushels more per acre requires a week longer to mature, and on account of the early frosts is not so well adapted to this district. Manchurian barley and Banner oats are generally a sure crop and require about the same length of time to ripen as Prelude wheat. The soil in the locality is mostly a stiff clay.

### FORESTS\*

Considering the area of the Mackenzie basin and the fact that it is forested almost throughout, the quantity of merchantable timber is relatively small and is confined entirely to the valleys of the streams.

A great deal of valuable forest has been destroyed in past years, both through carelessness of travellers with regard to camp fires and also deliberate starting of fires by the Indians to improve their hunting grounds, as the grazing animals feed on the prairie openings made by the fires. These forest fires are naturally more common along waterways where the best timber grows.

Through the efforts of the Forestry Branch of the Department of the Interior this waste by fire is by no means as great as it was a few years ago, but it is nevertheless a very deplorable loss since in that northern region tree growth is slow and reforestation takes much longer than in more southerly regions.

The banks of Clearwater river are timbered with spruce, tamarack, white poplar, and birch of a suitable size for milling. A portable mill is located at McMurray, the logs for which are floated down the Clearwater.

In the valley of the Athabaska below McMurray the forests are similar to those along the Clearwater but the trees are larger. Spruce have been found over 100 feet high and 11 feet in circumference at the bottom. Patches denuded by forest fires are frequent.

Trees fit for saw-logs grow along the Chenal des Quatre Fourches; they are cut during winter, hauled to the river by the dog teams, and towed by tug in summer to the saw-mill at Chipewyan.

The only valuable timber along Slave river is that which grows in the delta where the river empties into Great Slave lake. The spruce here attain a diameter of eighteen inches and make excellent timber. Good timber grows along the banks of all the streams, but a short distance back from the water it is small and fit only for firewood. When the steamer *Mackenzie River* was built at Fort Smith in 1887, all

\* Revised by the Forestry Branch, Dept. of the Interior, Ottawa



**TIMBER NEAR McMURRAY**

Many groves of good timber are found west of McMurray, north of the Athabaska, on the Thickwood hills.



the timber used in its construction was found in the surrounding forest, but at the present time there is very little of merchantable value. Along Salt river, west of the Slave below Fort Smith, spruce up to twenty-six inches in diameter and poplar to twenty inches are common.

Great Slave lake lies wholly within the forested region though some of its eastern affluents drain large areas of treeless country. The southwestern shore is well wooded as a result of better soil conditions but the northern and eastern shores are bare and rocky so that there is practically no tree growth except in some rocky depression filled with boulder clay. These depressions are more common toward the west. The area directly east of the lake is in what is known as the "Barren lands" district, and it contains no tree growth large enough even for firewood. This is the only unforested part of the Mackenzie basin.

At the easterly end of MacLeod bay on Great Slave lake two points run out from the north and south shores leaving a gap about one mile wide, through which the waters flow so swiftly and deep that it never freezes. Behind these two headlands lies Charlton harbour. The northerly point, called Fairchild, is well wooded with spruce measuring up to twelve inches in diameter, and it is the best source of timber in that locality. This point is about ten miles long and near the mainland is not over 700 yards wide. The current through the gap is caused by the water from Lockhart river which empties into Charlton harbour.

### *Timber Regulations*

New timber regulations have been issued for the Northwest Territories under Order in Council dated June 1, 1921, by which the Crown Timber Agent for the district, with an office at Fort Smith, is authorized to issue permits to owners of portable saw-mills to cut lumber, shingles, etc., on an area of one square mile each, at an annual rental of \$100 per square mile. Similar permits give authority to cut cordwood, fence posts, etc., the fees and areas being the same.

Permits to settlers to cut cordwood, pulpwood, fence posts, etc., to owners of steam-boats to cut wood for consumption on their boats within the Northwest Territories, or to mine owners for props and drilling outfits may be issued, at an established rate per cord or per piece, by members of the Royal Canadian Mounted Police who are authorized to act under the direction of the Crown Timber Agent in administering and enforcing these regulations.

Half-breeds, Indians, and Eskimos who are residents of the Northwest Territories do not require permits to cut timber for their own use, and free permits are granted for the construction of educational, religious, or charitable institutions.

Any further information regarding these regulations can be secured from the Crown Timber Agent at Fort Smith or from the Northwest Territories Branch, Department of the Interior, Ottawa.

### WATER POWERS

Great Slave lake lies in a depression with the outlet towards the west and an escarpment of considerable height on the north, east and south. This escarpment causes falls of considerable magnitude on the streams flowing into the lake, the more important of which are Parry falls on Lockhart river at the eastern end of the lake, the rapids on Slave river at Fitzgerald and the Alexandra falls on Hay river flowing into the lake at the southeast corner.

As Slave river is the main highway to the North much has been written on the rapids at Fitzgerald by almost all explorers and travellers, but since Hay and

Loekhart rivers are practically unknown in this way a description of the falls on these streams may prove interesting.

Sir Geo. Back, who explored Loekhart river in 1833-35, thus describes the falls:—

"The road to the falls, which we travelled on snowshoes, was fatiguing in the extreme and scarcely less dangerous, for to say nothing of the steep ascents, fissures in the rocks, and deep snow in the valleys, we had sometimes to creep along the narrow shelves of precipices, slippery with the frozen mist that fell on them. But it was a sight which well repaid any risk. My first impression was of a strong resemblance to an iceberg in Smurenverg harbour, Spitzbergen. The whole face of the rocks forming the chasm was entirely coated with blue, green and white ice in thousands of pendant icicles, and there were, moreover, caverns, fissures, and overhanging ledges in all imaginable variety of forms so curious and beautiful as to surpass anything of which I had ever heard or read. The immediate approach was extremely hazardous nor could we obtain a perfect view of the lower fall in consequence of the projection of the western cliffs. At the lowest position which we were able to attain we were still more than one hundred feet above the level of the bed of the river beneath, and this, instead of being narrow enough to step across, as it had seemed from the opposite height, was found to be at least two hundred feet wide.

The colour of the water varied from a very light to a very dark green and the spray which spread a dimness above was thrown up in clouds of light gray. Niagara falls, Wilberforce falls in Hood's river, falls of Kakabeka near lake Superior, the Swiss or Italian falls, although they may each ' Charm the eye with dread,' are not to be compared to this for splendour of effect.

It was the most imposing spectacle I had ever witnessed, and as its berg-like appearance brought to mind associations of another scene, I bestowed upon it the name of our celebrated navigator, Sir Edward Parry, and called it 'Parry falls.' "

Mr. R. G. McConnell of the Geological Survey who examined the rock formation along Hay river gives the following description in his report:—

"The falls here owe their origin to precisely the same cause as that which produces the famous falls at Niagara, viz., the superposition of hard limestone on soft shales and the consequent undermining and destruction of the former effected by the rapid erosion and removal of the supporting beds. I was surprised to find that the rate of retrocession dating both falls from the same period, has been almost identical. The Niagara falls are generally regarded as having receded six miles since they were brought into existence by the elevation of the country at the end of the glacial period, and on Hay river the distance between the point at which the limestone band makes its first appearance and the lower falls is almost exactly five miles, and between the same point and the upper falls, six miles. The equality of the work done by the two streams is however a coincidence as the factors in the two cases are entirely different. The volume of water which falls over the precipice at Niagara is many times greater than that carried by Hay river, while its erosive power is relatively less on account of its somewhat greater purity."

The following data on the water-powers of the north were prepared by the engineers of the Dominion Water Power Branch.

The water power possibilities of the lower Athabaska and Slave river districts have received but slight investigation up to the present time owing to their remote location from a ready power market. Tentative estimates of the amount of power available at the more important sites have however been made by the Dominion Water Power Branch. These figures will be revised from time to time as more data become available. The water-powers in this region will undoubtedly be of prime importance in the exploitation of natural resources as means of communication improve and settlement spreads to the northward.

On the lower Athabaska the Grand rapids site situated about 160 miles below Athabaska and 200 miles in a straight line north of Edmonton has been investigated by the engineers of the Dominion Water Power Branch. Tentative plans for development contemplated the provision of a 45-foot head by means of a long dam across the stream. With this head and the ordinary minimum flow of 2,300 cubic feet per second indicated by several records secured at Athabaska, there would be available some 9,400 horse-power. For six months of the year it is estimated there would be available 32,700 horse-power.

In the stretch of river from the foot of Grand rapids to McMurray, a distance of 75 miles, there is a drop of about 375 feet. It is thought possible to develop this total head at certain advantageous points, as the reach contains many rapids where rock outcrops occur on either bank. These rapids have not been investigated from a power standpoint so that detailed information is not available. Based on an ordinary minimum flow of 2,300 cubic feet per second the power available, using the total descent in this reach of river, would be 78,400 horse-power. For six months of the year it is estimated there would be available 272,700 horse-power.

The figures for maximum and minimum flow recorded at Athabaska during a three-year period were 108,640 and 2,200 cubic feet per second respectively.

Clearwater river, which enters the Athabaska from the east, at McMurray, is broken by several rapids which offer possibilities for small power developments. No power surveys have been made on the river and only one discharge measurement has been secured, which showed a flow in September, 1912, of 2,241 cubic feet per second. The most important rapids are Whitemud rapids, with a descent of 41 feet, located about four miles west of the interprovincial boundary separating Alberta and Saskatchewan; Aux Pins rapids, with a descent of 21 feet, located about four miles below Whitemud rapids, and Cascade, Le Bon, and Bigstone rapids, which occur about nineteen miles below Methy portage and have a total descent of 54 feet in a distance of 5 miles. Assuming an ordinary minimum flow of 370 cubic feet per second there would be available at Whitemud rapids 1,380 horse-power, at Aux Pins rapids 713 horse-power and at the Cascade site 1,830 horse-power. These power sites might prove of commercial value in conjunction with some very well timbered areas along the course of the Clearwater.

The power reach of the Slave river extends from Fitzgerald to Fort Smith, a distance of 17 miles in which the descent is about 125 feet. Practically all the drop occurs at five main rapids collectively known as Smith rapids.

Little or no information exists as to runoff conditions on the Slave river. Basing calculations on the conditions in somewhat similar watersheds an estimate of 29,500 cubic feet per second has been made for the ordinary minimum flow above Fort Smith.

Tentative estimates have been made of the power possibilities by assuming two concentrations; the first includes Cassette and Second rapids with a head of 69 feet and the second including Mountain, Pelican and Drowned rapids with a head of 48 feet. The estimated power available at ordinary minimum flow and 80 per cent efficiency at the first site would be 185,000 horse-power and at the second site 128,500 horse-power.

Both sites are accessible by Alberta and Great Waterways Railway from Edmonton to McMurray, thence by steamer from McMurray to Fitzgerald and finally by wagon road to the sites.

The Hay river, which enters Great Slave lake from the southwest, affords a possibility for power development at Alexandra and Louise falls. These falls occur at a point about 20 miles in a direct line from the mouth, where the river precipitates itself over a limestone escarpment forming the boundary of the Alberta plateau. Alexandra falls has a sheer drop of 105 feet and Louise falls situated about a mile and a half below descends 46 feet in a series of steps. No power investigations have

been made at these sites, but tentative estimates indicate a possible development at ordinary minimum flow of 16,000 horse-power at Alexandra falls and 7,000 horse-power at Louise falls.



ALEXANDRA FALLS ON HAY RIVER

The height of these falls is 105 feet and the geological formation of the escarpment is the same as that at Niagara.

Lockhart river enters Great Slave lake at its eastern extremity near the site of Fort Reliance. It has a total length of some 24 miles between Artillery and Great Slave lakes and in that distance descends a total of 668 feet. In addition to an almost continuous succession of rapids six falls are encountered, the greatest of which, Parry falls, has a sheer drop of 83 feet. No water-power surveys have been made to determine the most advantageous means of utilizing the available head on this river nor have any records of discharge been secured. Based on an estimated ordinary minimum flow of 1,270 cubic feet per second and using the total descent of the river, 668 feet, the power available would be 77,000 horse-power.

Many falls and rapids occur on other tributaries of Great Slave lake such as the Buffalo, Grandin, Yellowknife, Talston and Hoarfrost rivers. Owing however, to the difficulty of defining their drainage basins and the paucity of information regarding runoff, it is not possible to estimate with any degree of accuracy the water-power possibilities of these streams.

### FISHERIES\*

The chief article of diet in the northern country both for human food and dog feed is fish. The numerous lakes and rivers abound with fish of excellent quality and size, and they are caught with hook and net both in summer and winter. The best fishing season, however, is late in the fall, when the fish freeze shortly after being taken from the water and consequently keep in prime condition till spring.

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\* Revised by the Department of Marine and Fisheries, Ottawa

While almost all the bodies of water contain fish, the marvellous productiveness of Great Slave lake and of the many rivers emptying into it have been many times commented on by travellers. Just before the advent of cold weather the fish leave the deeper parts of the lake and come to the shallower parts to spawn. This is the time to secure the winter's supply and whitefish, trout, pike, sucker, and inconnu are taken in large numbers. Many of the whitefish weigh over three pounds, and a few have been caught which weigh twenty pounds. The amount of fish annually taken from Great Slave lake is estimated at half a million pounds. This supplies the Hudson's Bay posts, Missions and Indians at Resolution, Hay River, Providence, and Fort Rae. As the fishing season lasts only about three weeks, the Big Island fishery which supplies most of the catch is a very busy place, furnishing employment to a great many Indians. The inconnu is a fish native to Great Slave lake and Mackenzie river, as the species has not been identified in any other locality except a few in the rivers flowing into the Arctic ocean near the Mackenzie. It ascends the rivers flowing into the lake as far as the falls but has never been found above these points. It is called the "inconnu" because it is found nowhere else. The species is a large white-fleshed silver-scaled salmon in appearance and weighs from fifteen to forty pounds. It is not very palatable and is eaten by the Indians only when better fish cannot be obtained, but it furnishes splendid dog-feed. Trout are also plentiful and, though not so large as the inconnu, are very palatable for human food.

The catch of fish in this region is limited to local consumption as no facilities for export exist. Even if transportation could be secured the long haul to the nearest market, Edmonton, would appear to be commercially prohibitive.

As fish is the diet most easily obtained settlements are located along the water routes. The old trading and exploration posts were also selected at spots where fish seemed to be most abundant so that the northern fishing grounds to a great extent have determined the trend of settlements and fur trading routes.

The fishing grounds on the north side of Big island, near Providence, seem to be inexhaustible. With a few good fishermen and a supply of nets a large body of men could be wintered there in safety. At no other Hudson's Bay post can so many people be maintained with so much certainty on the resources of the country.

### GAME\*

The Athabaska and Slave river district abounds with game, both large and small. The larger game consists of moose, wood buffalo, caribou, timber wolves, and bears, the first three of which are hunted for their flesh as well as their skins. Almost all the smaller fur-bearing animals are found in this region and the thick hair provided by nature for animals in cold climates, makes the fur more beautiful than that of animals farther south.

Moose are found throughout the whole district north to the limit of tree growth, being fairly plentiful as far north as McPherson. They also roam as far south as Jasper, over 1,000 miles south of McPherson. A full grown bull moose stands about seven feet high at the shoulders, weighs about 1,300 pounds and the spread of his antlers is over five feet. They browse on the small willow in winter or on the wild hay after pawing the snow away. As crust seldom forms on the snow in this cold climate the moose can travel through the forest with incredible speed even in winter. A single timber wolf will not attack a bull moose as the moose would soon overtake him in the loose snow and one stroke of his forefoot would quickly dispatch the wolf. In summer the young and the female moose shun attacks from wolves by swimming, as they generally remain near some body of water.

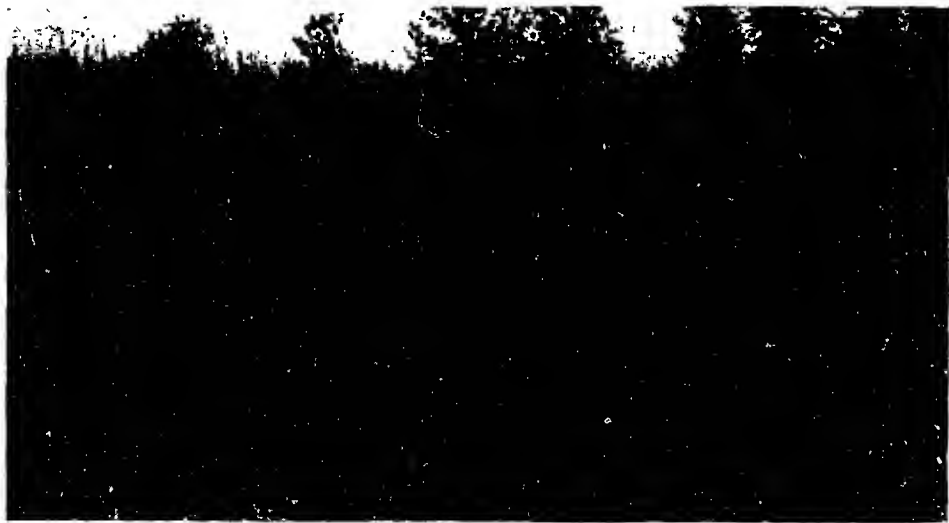
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\* Revised by the Dominion Parks Branch, Dept. of the Interior, and Geological Survey, Dept. of Mines.

Moose meat is highly prized by the Indians and so many of them are slaughtered annually that their numbers are constantly diminishing. Unless some further protection in the matter of stricter game laws is given them they will soon become extinct in this district.

The wood bison or buffalo formerly ranged over immense areas even to the north of Great Slave lake and westerly to Liard river, but they are now confined to a few hundred on the west side of Slave river between Peace and Mackenzie rivers. All the early explorers reported having seen herds of them.

The wood buffalo are a sub-species of those that roamed the great central plain as far south as Louisiana. They are larger and darker with hair more dense and silky than the typical plain species and the horns are slenderer and more incurved. Many of them until recent years were killed by the Indians for the skins as well as the meat and now they very often fall a prey to the timber wolves as they do not travel in bands sufficiently large to resist the attacks of these animals. The calves and their dams stay with the larger herds as much as possible and are never found roaming alone. When feeding or moving slowly the calves are always in the centre so that it is hard to see or count them. Even their tracks are pretty well covered



**WOOD BUFFALO WEST OF SLAVE RIVER**

This area is the only district in Canada where buffalo roam in a wild state.

up with the enormous imprint of the bulls' hoofs. When attacked by wolves the herd closes up in defensive formation, the big bulls forming a ring around the outside with the calves and cows in the centre.

The wolves never attack a herd in defensive formation. They prowl around following the herd until one bison strays too far away, when they attack and generally dispatch him.

In summer the buffalo prefer the rolling poplar and jack pine country to escape from the flies which abound in the open. There they dig wallows where they can roll and sand themselves. The trees are used as rubbing posts and branches are broken sometimes as high as eight feet from the ground. When the sloughs dry up in the fall the buffalo come out in the open places which constitute their winter feeding

ground. A herd can feed over each slough only once as the snow becomes tramped and packed as hard as the pavement, so that they have to keep moving from place to place all winter.

Within historic times the musk ox ranged over the whole extent of the so called "barren lands" from the mouth of the Mackenzie to Fort Churchill, but in the eastern and western sections of this area the Eskimos and Indians, respectively, have gradually exterminated them, so that now the musk ox is to be found only in the central northern region where it is more immune from man's interference.

Like cattle, the musk ox lives on grass and is adapted to any district in the north where grass grows, but unlike cattle they graze in one locality until they have finished all the feed before moving to another. A grazing herd moves from three to five miles per month. Grass grows in the Arctic tundras, the barren lands to a large extent being barren only in the sense that no trees grow.

The musk ox seldom runs from a dog or wolf. Like the reindeer, it furnishes milk and meat, but in addition, each musk ox produces annually a quantity of very fine wool. At present there is no demand for this wool as there is no supply, but no doubt a market will develop as soon as the available quantity becomes sufficiently large.

A full grown musk ox weighs about 600 pounds and produces twice as much meat and twice as much fat as a reindeer. Its milk differs very little from cow's milk except that it is richer in cream. The skin of the musk ox does not make as good clothes as that of the reindeer, but it compares favourably with that of the domestic sheep. Its long black hair which reaches nearly to the ground is never shed but the under coat of wool is renewed every year, and from this clothing of very fine texture can be made. The wool resembles the pashmina of Kashmir. The greatest difficulty in making mercantile use of this wool is separating it from the long coarse hair, but experiments along that line are proving successful.

The Eskimo hunts the musk ox with dogs from which, as stated above, they do not flee. On sighting a small band he lets one or two dogs loose when the older animals immediately face outwards in defensive formation with the calves in the centre, and prepare to give fight. As soon as the herd is thus "anchored" the Eskimo lets all his dogs loose and then proceeds to kill the musk ox with gun or bow and arrow. The musk ox are very fierce, and if a wounded bull charges the Eskimo, the dogs in turn immediately attack him, which gives the hunter a chance to shoot a second time. In this way the Eskimo is able to dispatch the whole herd.

The barren land caribou are found in the barren lands east of Great Slave and Great Bear lakes only during the winter, as they migrate northerly in summer. The northward movement commences in March and extends about 400 miles, while the southerly migration begins in August. The southerly limit of their feeding ground is practically a line between lake Athabaska and Churchill on Hudson bay, where they roam in bands numbering tens of thousands. In 1877 the band of caribou which migrated north, past Fore Rae, on the north arm of Great Slave lake, was fourteen days in passing and presented a mass so thick that daylight could not be seen through the column.

A few straggling caribou have been seen in the southerly part of the barren lands during the summer but such instances are not numerous. Another species of the caribou is found west of the upper Mackenzie and is called the woodland caribou, or Indian deer. They are not very common and herds of this species seldom exceed thirty or forty except in autumn, when larger numbers sometimes congregate.

The caribou are killed by the Indians and Eskimos mostly at the time of their southerly migration. Besides the flesh, which is very palatable, the skins are used for various purposes, tent covers and clothing being the principal ones. The hair is very thick and as each hair is hollow the caribou when swimming float high out of the water. They can swim so fast that it requires a good canoeist to overtake them. An additional feature to the warmth of clothing made from reindeer skin

is the fact that the hollow nature of the hair makes the clothing a splendid non-conductor. The hair is also used to fill life belts as it renders them very buoyant.

In their migration the caribou do not always follow the same route as that of the previous year, and as the Indians have no established lines of communication a starving band may be waiting for the arrival of the caribou which may be passing in countless numbers within twenty miles of them.

The caribou belongs to the same genus as the reindeer and both thrive under similar conditions. On the southern part of Baffin island, which he has leased for a period of thirty years, Mr. Vilhjalmur Stefansson intends raising both caribou and reindeer, but the North American Reindeer Co., who have acquired a similar lease on the west shore of Hudson bay, intend to raise only reindeer.

In the wooded portion of the district gray or timber wolves are fairly abundant, especially in the Birch mountains and west of Fort Smith; some of the species, chiefly those in the mountains, are nearly black and grow to a large size, over five feet in length. They live largely on rabbits which they often take from snares of the Indians and when rabbits are scarce they kill larger game, even sledge dogs being among their victims. Caribou are only killed when one strays away from the herd, as they easily defend themselves from wolves when in a circle or hollow square formation with heads out. Human beings are seldom attacked unless the wolves are starving, as they are afraid of man. Wolves roam about singly or in small packs, but not more than half a dozen are seen in one pack except on rare occasions. The imprint of the foot in the snow is as large as the human hand, in some instances measuring seven inches wide and eight inches long.

In the Northwest Territories the Dominion Government gives a bounty of twenty dollars for each wolf killed. The amount paid each year varies considerably as in the fiscal years 1918-19 and 1919-20 the numbers killed were 298 and 136 respectively. The wolves are very wary and difficult to trap but the Hudson's Bay Co's trappers manage to secure them. The Indians are reluctant to shoot a wolf as they are very superstitious and firmly believe in the transmigration of souls. Consequently shooting a wolf means shooting one of their dead forefathers or other relatives.

In order to prevent fraud in the collection of bounty more than once on a wolf hide, it is marked by being split from ear to ear by the official paying the bounty and then returned to the trapper.

Black bears are fairly common in the Athabaska valley. They are quite harmless and will flee from human beings. They live chiefly on blueberries which grow in abundance in the marshes and muskegs. When the supply of berries is scarce some of these animals, instead of hibernating as usual, roam about all winter in search of food.

The barren ground bear resembles the grizzly bear so closely in size and ferocity that it is sometimes mistaken for one. The head, however, in general is more yellowish than that of the grizzly, though the colour of the hair differs with age and seasonal bleaching, so that this distinction is not always reliable.

The scarcity or abundance of lynx in northern Alberta depends on the available supply of rabbits, but they never become very plentiful as the Indians are continually snaring them. The flesh of the lynx is said to be very palatable but it is chiefly for their fur that they are trapped. A full grown lynx measures nearly three feet in length and about half that in height. It runs in short bounds and can be overtaken by a man in the open. It, however, swims well even in a very swift current and when cornered will fight fiercely. When it is caught in the snares set by the Indians it makes very little effort to get away and lying down in the snow soon perishes from the cold.

Rabbits are common throughout the whole region where shrubs grow. The species is subject to great fluctuation in numbers, gradually becoming plentiful for a period of years and then rapidly dying off. The periods of greatest abundance occur about



every seven years, but this does not happen with absolute regularity nor at the same time in all sections of the country.

Dense willow and other shrubs are eaten almost to the ground by the rabbits, and banksian pine suffers considerably from their ravages during winter; in summer they crop grass very close in every locality. The species around Chipewyan grow to an average length of about eighteen inches.

In winter they form a very large portion of the diet of the Indians by whom they are snared, but the Indian resorts to eating rabbits only when his indolence prevents him from hunting other game, which often happens in the course of the winter. The snared rabbits are frozen and used when needed. The fur is not of much value except when cut in strips and woven to make robes on a frame of the desired size. On account of their lightness and warmth these robes are second only to those made of caribou skin.

As rabbits constitute the food supply of most of the northern carnivorous fur-bearing animals, the periodic scarcity of rabbits is soon reflected in the scarcity of these animals, which, however, again become plentiful as soon as rabbits begin to increase in numbers.

Muskrats are very common in the deltas of Peace and Athabaska rivers and also in the muskeg ponds around Chipewyan. They are quite generally distributed throughout the northern region even beyond the limits of the forest. They average about twenty-one inches in length and weigh about two pounds when full grown. The muskrat villages are generally along some sandy bank into which they burrow from below the water level. Houses are sometimes built in the marshes and reeds and are somewhat similar to those of the beaver, but more easily destroyed by predatory animals. It is only within recent years that the skins were considered of any value but a considerable part of the northern fur trade now consists of the pelts of these animals.

The beaver, which formerly was abundant throughout this whole region, is now almost exterminated in many parts and nowhere is common, although a few pelts are received by almost all the posts annually.

A considerable number are traded at Fond du Lac, an outpost of Chipewyan near the eastern end of lake Athabaska. The region, however, from Great Slave lake westerly to the Rocky mountains seems to be the only present habitat of fairly large colonies of beavers and is the best beaver country of the north. The Beaver Indians bring in many skins from the upper reaches of Hay river and the adjoining tributaries of the larger streams. In the spring the animals often descend the smaller creeks to the main rivers, which they follow to the next tributary.

The colonies of beavers build their houses substantially in the shallow parts of small streams, which they dam below to make the water rise around their houses and protect them from attacks of land animals. The reason no colonies are found in the larger streams is because the erection of a dam would present too great a difficulty.

These dams in process of time become filled up with silt, carried down by the stream, which is forced to find a channel, exposing what is known as a "beaver meadow," which in time affords excellent pasturage. These beaver meadows are numerous but as they all lie on small streams they are never of very great extent.

The beaver has thus indirectly contributed to the wealth of northern Canada by furnishing feeding grounds, both summer and winter, to the grazing wild animals upon which the inhabitants of the country are mainly dependent for the greater portion of their food and clothing.

The district around Resolution furnishes a great many fox skins, of all varieties. Owing to the keen rivalry among the different trading companies a very high price is sometimes paid for an unusually fine black or silver fox.

The deltas of Peace and Athabaska rivers, at the west end of lake Athabaska, also are favourite trapping grounds in early winter. The foxes are attracted to this locality by the large numbers of wounded ducks and geese which escape during the

fall hunt and are dug out of the snow in winter by the foxes. Upwards of fifty black and silver foxes, in addition to large numbers of skins in the red and cross phases, have been traded at Chipewyan in a single season. About two hundred skins were traded at Resolution, most of them coming probably from the eastern end of the lake. During winter the fox lives on rabbits, mice, lemmings, grouse or any other fowl which can be secured.

Many small fur-bearing animals are found in the north, the furs of which are very valuable and form an important asset of the district. The otter, mink, fisher, and marten are trapped along the banks of the rivers and lakes where they can find plenty of fish, while the weasel has a habit of entering storehouses, perhaps in search of mice, of which it is very fond, though appearances indicate that it also relishes supplies of fish and dried meat.

The waterfowl of this region consist of many kinds of ducks and geese. They are all migratory birds and arrive from the south towards the first of May. The reedy deltas of the Athabaska, Peace, Slave and Salt rivers, and also the western end of Great Slave lake are the favourite resorts of these birds where they remain for a short time in spring and autumn.

At these seasons of the year great numbers are killed, supplying food for the Indians in abundance. They are so numerous that a flock, rising on being scared, perceptibly darkens the immediate locality for a few seconds, and their noisy honking at night makes sleep impossible to anyone camping near.

Loon, ruffed grouse and partridges are fairly plentiful, but pelican are rather scarce.

Only a few species of reptiles are found in lower Athabaska district. Snakes were observed as far north as Salt river plains near Fort Smith. This is also the limit for toads, but frogs have been found in Great Bear lake and the lower Mackenzie. Frogs make their appearance around Chipewyan about May 1. They are common in the swamps and marshes around the settlement and lay their eggs as soon as the surface and edges of the lakes thaw, even if the bottom remains frozen.

For the sake of convenience the regulations for the protection of game in the Northwest Territories is appended. Any further information regarding game or game laws can be obtained from the Commissioner of Dominion Parks, Ottawa.

## REGULATIONS FOR THE PROTECTION OF GAME IN THE NORTHWEST TERRITORIES

### LICENSES

#### *Hunting and Trapping*

1. No person except a native-born Indian, Eskimo or half-breed, who is a bona fide resident of the Northwest Territories, shall engage in hunting or trapping game without first securing a license so to do.

2. The fees for such license shall be as follows:—

For a bona fide resident of the N.W.T. . . . .	\$ 2 00
For a non-resident, British subject. . . . .	25 00
For other non-residents. . . . .	50 00

3. The holder of a *hunting and trapping* license shall have the right to hunt, kill, take or trap game during the open season, and at all times may have in his possession or may sell or trade the pelts and skins of such game as he may have legally trapped or killed.

4. Every holder of a *hunting and trapping* license shall, on or before the first day of July following the close of the year for which it was issued, return such

license to the nearest game officer or warden with a true statement on back of license showing the number of each kind of game killed under such license.

5. No person who is the holder of a *hunting and trapping* license shall at any time have unprime skins of game in his possession.

6. No license shall confer the right to hunt or trap on Victoria island, Northwest Territories.

7. Any person who is the holder of a *hunting and trapping* license or any Indian, Eskimo or half-breed shall, upon leaving the Northwest Territories, report to the nearest Royal Canadian Mounted Police post and there make a statement as to the number of game killed by him and the number of game in his possession or disposed of by him.

8. The holder of a *hunting and trapping* license obtained for sporting purposes only, shall not kill more than the following number and kinds of game:—

Moose, 2 males.

Deer, 2 males.

Mountain sheep, 2 of any one species, 3 in all.

Mountain goat, 2 of any one species.

### *Trading and Trafficking*

9. No person shall engage in the business of *trading and trafficking* in game in the Northwest Territories without first securing a license so to do.

10. Each person thus engaged, in the employ of any person, firm, company or corporation trading and trafficking in game must obtain a separate license in his own name.

11. Nothing in this class shall prevent any person, firm, company or corporation employing persons to assist the holder of a license at the post only.

12. The fees for such license shall be as follows:—

For a bona fide resident of the N.W.T. . . . . \$ 5 00

For a non-resident, British subject. . . . . 50 00

For other non-residents. . . . . 100 00

13. The holder of a *trading and trafficking* license shall have the right to trade and traffic in pelts and skins of game during the open season and to trade, traffic in, and have in his possession during the close season the pelts and skins of game legally killed in the open season.

14. Every holder of a *trading and trafficking* license shall, on or before the 1st day of July following the close of the year for which it was issued, return such license to the nearest game officer or warden with a true statement on back of license showing the number of each kind of game traded or trafficked in by him (1) with any native-born Indian, Eskimo or half-breed; (2) with all other persons.

15. No person, who is the holder of a *trading and trafficking* license, shall at any time have any unprime skins of game in his possession.

16. Any person, who is the holder of a *trading and trafficking* license, shall, upon, leaving the Northwest Territories, report to the nearest Police post and there make a true statement as to the number of game in his possession, or game traded and trafficked in by him with any person under such license.

### GENERAL TERMS RELATING TO LICENSES

17. All licenses shall be issued by the Commissioner of Dominion Parks and shall be countersigned by a game officer or warden of the Northwest Territories. Such license shall not be valid unless the signature of the person to whom it is issued is endorsed thereon.

18. Any person who fails or neglects to return a license within thirty days of the time limited for its return, may, in addition to being liable to the penalties as provided in the Act, be refused a license in any subsequent year.

19. Any person, the holder of a license, who wilfully makes a false return as to the number of game hunted, trapped, taken, traded or trafficked in, under such license, shall be guilty of a violation of these regulations.

20. Any person who is the holder of a license is liable to have the same cancelled upon a second conviction against him under the provisions of the said Act or Regulations made thereunder.

21. The term "non-resident" shall mean any person who has not lived in the Northwest Territories for two consecutive winters immediately prior to the date upon which application for license is made.

22. "Post" means an existing trading establishment in continuous operation for a period of two years.

23. Any British subject who is a bona fide employee at a post shall be deemed a resident for the purposes of these regulations.

24. In cases where a license is taken out in the name of a person in his capacity as an employee of a trading company, such license shall authorize such person to engage in trading and trafficking only while he remains in the employ of such company. In the event of his services being terminated during the term of the license such license may be transferred upon the written request of the Company under the authority of a game officer or warden to the successor of the said licensee.

25. No person who is the holder of a license shall export from the Northwest Territories the meat of any game.

26. Any person who is the holder of a license must, upon the request of a game officer or warden, produce his license.

27. All licenses shall expire on the 30th day of June of each year.

#### POISON

28. No person shall have in his possession any strychnine or other poison. No person shall use poison for the purpose of destroying game or other mammals or birds.

29. Notwithstanding the above clause, any hospital or qualified medical practitioner may have in its or his possession such quantities of poison as are ordinarily used for medical purposes.

30. When specified by a permit, arsenic or other preservatives may be in the possession of persons hunting, killing, taking, capturing or trapping specimens of game or other animals for scientific purposes.

31. Poison may be obtained from the Commissioner of Dominion Parks by game officers and may be used by them for the destruction of wolves.

32. The finding of any poison in the line of operation of any person engaged in trapping shall be prima facie evidence of the guilt of such person and the onus of proof to the contrary shall rest upon him.

33. Any game officer, game warden, constable or other peace officer who suspects that any person has poison in his possession may, in search of poison, search any outfit, kit, parcel, chest, box or receptacle, or enter any premises or tent, or board any vessel, or conveyance of any common carrier.

#### GENERAL REGULATIONS

34. No game shall be trapped or taken by means of any contrivance except such types of guns, rifles, traps and ammunition as are now in common use in the Northwest Territories.

35. No person shall at any time kill or take any female moose, caribou, deer, mountain sheep, or mountain goat with young at foot or any of the young at foot of these mammals.

36. No person shall destroy or injure at any time any beaver or muskrat house.

37. No person shall put into or have in storage in the Northwest Territories game not killed in the open season. The skins of game, lawfully killed by explorers and others, as specified under subsection 3, of section 4, of the Act, to prevent starvation, may be legally held in possession by them but may not be traded, trafficked in or sold.

38. Musk ox may be hunted and killed by Indians, Eskimos or half-breeds who are bona fide inhabitants of the Northwest Territories but only when they are actually in need of the meat of such musk ox to prevent starvation. No person shall at any time trade or traffic in musk ox or any part thereof, and the possession of the skins of such musk ox by any other person than the said Indians, Eskimos or half-breeds shall constitute an offence.

#### GAME OFFICER

39. The Minister may appoint game officers whose duties shall be to supervise the protection of game in the Northwest Territories and such game officers shall carry out their duties under the direction of the Commissioner of Dominion Parks.

#### GAME WARDENS

40. The Minister may appoint game wardens for the protection of game in the Northwest Territories who shall act under the direction of the Commissioner of Dominion Parks.

41. All disputes relative to trap lines shall be decided by the game officer or warden of the district. An appeal may be taken from this decision to a Justice of the Peace.

### TRANSPORTATION

The established route for reaching the Slave and Lower Athabaska district has changed so often during the past hundred and fifty years that a brief sketch of the changes is necessary to follow the trend of development.

The early Hudson Bay traders from the Athabaska region brought their furs to Port Nelson by way of Methy portage, connecting Clearwater river with the sources of the Churchill. This portage was twelve miles long, and canoes were used for the rest of the distance. The trip was made by the Indians in the spring and kept them absent for a great part of the summer thus affording the animals an opportunity to increase after the trapping and hunting of the previous year.

Trade was confined to this routine order till about 1784, when a few adventurous traders from Montreal formed the Northwest Co., and crossing Methy portage intercepted the Indians practically before they set out from the hunting ground. By this move most of the fur trade was diverted to Montreal.

Such action aroused the Hudson's Bay Co. who sent explorers across the portage and down the Athabaska establishing trading posts at several points. The Northwest Co. did likewise, the most important of their explorers being Sir Alexander Mackenzie who explored the river which bears his name.

Bitter feeling existed between the company traders, so much so that at times one party made prisoners of the other and did not release them until the trading period was over. This condition of affairs lasted till 1821 when, by mutual consent, the Northwest Co. was absorbed by the Hudson's Bay Co.

Any futuro attempts of free traders entering this territory were quite successfully illustrated by the Hudson's Bay Co., as they would transport no free trader on their scows or tramways and would sell him no supplies from their trading posts.

Even after the Canadian Pacific railway was constructed to Winnipeg the Methy portage was still used to supply the northern trading posts, the route from Winnipeg following lake Winnipeg and the water route by Saskatchewan and Sturgeon-Weir rivers to the Churchill at Frog portage.

When Edmonton was connected by railway with eastern Canada it became the distributing centre for all the north country, trade going down Athabaska and Mackenzie rivers and even up Peace river to Hudson Hope during summer, as the summer trail from Lesser Slave lake to Peace River was well nigh impassable.

The only great obstruction to traffic on the Athabaska was at Grand rapids, where the Hudson's Bay Co. built a tramway for portaging freight while the empty scows were tracked up or run down the rapids and again loaded.

With the construction of the Edmonton, Dunvegan, and British Columbia railway, the town of Peace River has become the distributing centre for most of the northern trade, but when the Alberta and Great Waterways railway is built to McMurray, the Athabaska will again be the principal route, as the only obstruction to navigation between McMurray and the Arctic ocean is at Fitzgerald on Slave river. The rapids and falls east of Fort Vermilion make a similar break in the Peace River route.

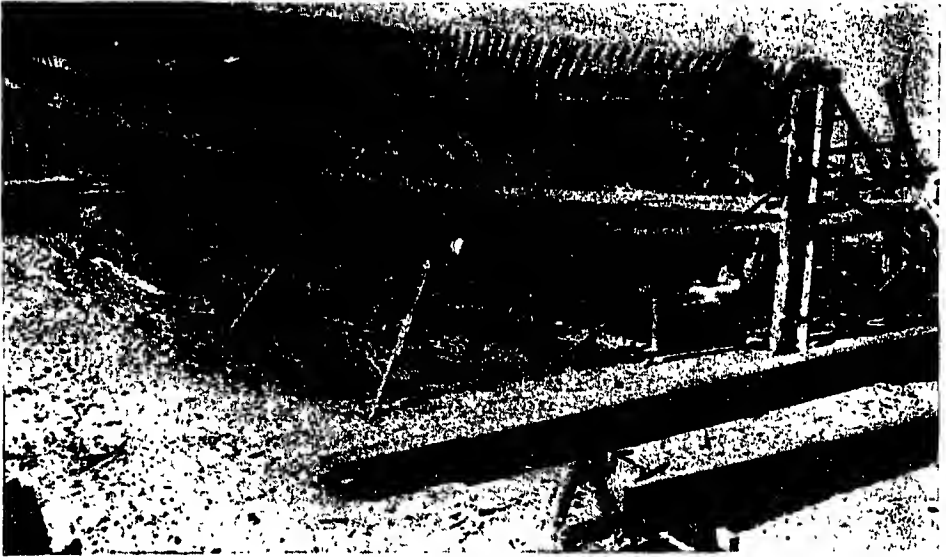
The Hudson Bay route again bids fair to be a competitor for the European trade for, with the construction of the railway to Port Nelson, or Churchill, the distance between Prince Albert and Liverpool, by this route, will be over 1,000 miles shorter than by way of Montreal. Hudson bay, of course, is generally closed to navigation from November to June, but during navigation season ocean steamers can enter either Churchill or Port Nelson harbours. The Nelson shoals render the Port Nelson harbour rather dangerous in stormy weather, but Churchill is an ideal ocean port, and offers a good location for railway terminals. This route to European ports would save a rail haul of over 1,200 miles for trade from Prince Albert and northern Alberta.

In the lower Athabaska district internal transportation is by boats, scows, and canoes in summer and dog teams in winter.

A steamboat service is maintained on Athabaska river from McMurray to Fitzgerald, and up Peace river to Vermilion chutes. From Fitzgerald there is a sixteen-mile portage to Fort Smith where another line of steamboats plies to Providence and down the Mackenzie to McPherson. The round trip from McMurray to Fitzgerald takes about eight days and from Fort Smith to McPherson about twenty-six days. The steamers are flat-bottom stern paddle-wheel boats of shallow draft and if a wind storm is encountered on either lake Athabaska or Great Slave lake they tie up till it is over. The round trip then takes longer than the scheduled time. The predominant idea with these steamers is "safety first," schedule time being a secondary consideration. From McMurray to Providence the down-stream fare in 1921 is about forty-seven dollars, exclusive of meals or berths, and the up-stream fare eighty dollars, both fares including the portage by team at Fitzgerald. The freight rates down and up stream were 6½ and 8½ cents per pound respectively for the same distance.

The end of steel on the Alberta and Great Waterways railway is still about sixteen miles from McMurray, near the confluence of Clearwater and Christina (Pembina) rivers. A gasoline boat conveys passengers and freight from this point to McMurray, or transportation can be secured by wagons over a fairly good wagon road.

During winter all transportation is carried on by dog teams and sleds, as the snow is too deep for horses and feed is very scarce. The husky sled dog is a species of wolf; no further proof of that fact is needed than the blood-curdling howls and fiendish snarls he exhibits while being harnessed. A dog train usually consists of four large dogs or five small ones, and the average load they can haul on a fairly good trail is four hundred pounds. The customary feed is fish, and dogs thrive with a daily ration of six pounds each. On these northern trails fish are easily obtained as the trails generally follow along water routes, where fish can be secured even in winter through holes cut in the ice.



S.S. DISTRIBUTOR UNDER CONSTRUCTION AT FORT SMITH, JUNE, 1920

The light draft required for boats operating on the Mackenzie river makes it necessary to construct them locally, and the boat builders of the North are expert designers and builders of the most suitable kind of craft.

During summer, when the Indians leave their hunting ground by canoe for the open lakes and rivers, the dogs are left behind to hunt, steal or starve until the Indians return in the fall. In spite of this inhuman treatment the dogs again serve their masters as faithfully as if they had been regularly provided for.

Husky dogs require no shelter, as at night, after being fed their ration of fish, they curl up in the snow and go to sleep, their thick coat of hair protecting them from the rigorous cold. This thick hair, to a certain extent, also protects them from the severe beatings of their drivers.

At many of the posts as far north as Fort Smith horses are used for summer work and heavy hauling on good winter trails, and at the posts beyond Fort Smith oxen are used for that purpose. In cases of necessity, however, dogs can be used instead of horses, from ten to twelve dogs being equal to one horse.

For travelling, dog teams are the most useful and convenient. They can travel across or along rivers when the ice is fairly thin and their trail over the frozen snow is so shallow that it catches very little drift. In heavy snow a trail can easily be broken for them by a man on snowshoes and a track made one day will carry dogs, without sinking, the following day.

The numerous rapids on Slave river, between Fitzgerald and Fort Smith, can be run with a scow at high water, but it requires experienced boatmen and even then is a dangerous undertaking. Scaws with heavy drilling apparatus of the Imperial Oil Company were run down recently as it was impracticable to haul the machinery over the 16-mile portage with horses. Many independent traders still follow the river, and portage at the most dangerous rapids, at one of which (Mountain rapids) the scaws have to be hauled up till one hundred feet high with horses and block and tackle.

The portage road, recently graded, is located a short distance back from the river and freighting teams haul from 1,200 to 2,500 pounds per load for about three-quarters of a cent per pound. A motor bus capable of carrying 15 persons operates over the portage road. This road was built by the trading companies operating the different steamboat lines, and a number of Indians living at Fitzgerald and Fort Smith are employed by the companies almost continuously throughout the summer. These freighters supply their own wagons and horses and as winter work for teams in this locality is lacking, the horses are allowed to rustle for themselves all winter on the plains along Salt river west of the Slave.

It might be noted that the Hudson's Bay Company have a telephone system installed between Fort Smith and Fitzgerald. They have also begun a preliminary survey for the construction of a narrow gauge railway, next year, over the portage; but this undertaking is contingent upon future developments in the Norman oil fields.

In addition to the steamboats already in use, the Hudson's Bay Company are having two stern-wheel steamers built in parts at Vancouver. These will be shipped overland and the parts assembled, one steamer for use on Peace river and the other on the Mackenzie.

In connection with the development of their oil fields the Imperial Oil Co., in June, 1921, sent one of their geologists to Norman from Peace River by aeroplane, in order that claims could be staked out prior to the arrival of prospectors, by canoes or motor boats, down Mackenzie river.

## SURVEYS

The only regularly subdivided land north of McMurray consists of townships through which Athabaska river flows. These extend north to township 101 but base lines have been run across every twenty-four miles north as far as township 116, or about twenty-five miles north of Chipewyan. The reports of surveyors for subdivision and base lines have all been published. Settlements have sprung up along the more important water routes and many of the traders and settlers requested title for the land on which they were squatted. As many of these settlements lie beyond surveyed territory, isolated settlement surveys had to be made at McMurray, McKay, Chipewyan, Fitzgerald, Fort Smith, Resolution, Hay River, and Providence, lots being laid out to conform as much as possible with the settlers' claims. Plans of these settlements were made and patents issued to the respective claimants. Where any previous Dominion land survey lay within reasonable distance the settlement survey was tied to it, but otherwise it was checked by observation.

The Hudson's Bay Co. have made surveys of their trading posts in the various settlements but only those surveys that have been made by a Dominion land surveyor have been approved by the Surveyor General.



## SETTLEMENTS

The settlements of the northern region are of a scattered nature and consist of trading posts established by the fur companies, with a few houses to accommodate the factor and his assistants. The Royal Canadian Mounted Police, (formerly the Royal Northwest Mounted Police) have barracks at a great many of these centres to preserve order and enforce law in the district.

During the fur trading seasons the posts are the rendezvous of the Indians, who come to trade their furs for ammunition, rifles, and other imported goods. Some of the half-breed trappers have houses at the post where they leave their families while on hunting expeditions, but the Indians take their families and all their belongings wherever they go, and pitch their tents where night overtakes them. If a moose is killed the Indian moves his tent there as it is much easier than moving the moose.

This nomad life is more sanitary for the Indians than living in a closed-up house, as they are not a very cleanly race. The result of housing is reflected in the ravages of that dreaded disease, tuberculosis, which is so prevalent among the Indians living in shacks, while the nomad Indians appear to be almost immune to it.

The nucleus of every post was originally a place to collect the furs from the Indians of the surrounding area and transport them in bales to the headquarters of the company which established the post. Three main factors contributed largely to the location of a trading post. First it was necessary to have a good hunting ground in the vicinity, secondly it had to be near a waterway and easy of access, and thirdly, a supply of edible fish must be easily procurable. A few of the posts established lacked some one of these essentials but possessed the others in a marked degree.

Competition is the life of trade and trade is the forerunner of civilization. While the Hudson's Bay Co. enjoyed the monopoly of trade the Indians brought their furs to the headquarters of the company and no posts were necessary. With the formation of the Northwest Co. in 1784, the agents of each company went to meet the Indians, and the one who reached them first secured the furs. The establishing of permanent posts for the agents was but a further step in the development of the scheme and the locations of these are the settlements of to-day, with a few slight changes.

The first place of importance reached on proceeding to the north country is McMurray, situated at the confluence of the Clearwater and Athabaska rivers. At one time it was a very important place, as it lay on the route by which all goods were transported to the north whether by the Hudson bay, the Cumberland House, or the Edmonton route.

Portaging on any of these routes ceased at McMurray, and the large crews of men necessary for transportation over the portages, after resting there, returned the way they had come. The prairie land around McMurray may be the result of fires started by these men during their sojourn in the vicinity. Some years ago the Hudson's Bay Co. moved their trading post from McMurray to McKay, about thirty miles farther north, but the post at the former place has been re-opened owing to the increase of trapping in the surrounding area. When the Alberta and Great Waterways railway is completed McMurray will again be a prominent place, as it will be the distributing centre for all the export trade and the collecting point for all fur shipments.

McMurray is also the centre of the area of bituminous sands, locally known as "tar sands," and will be the location of any industry for their development. Power for such an industry could possibly be secured from Grand rapids, which are less than sixty miles distant.

During the years of McMurray's importance, when the Clearwater formed part of the principal highway to the North, large fields were cultivated around the site of the present post and on the large island opposite in the Athabaska, but these fields

have been abandoned for some time and are grown up with brush, as it was found that a ten-acre field would produce more grain than could be disposed of in the locality, a few years ago.

From McMurray, goods were transported to the north by steamer, and the scows which ran down the rapids were tracked back loaded with furs.

The original name of McKay was Little Red River. This post is located at the confluence of Athabaska and McKay (Red) rivers about thirty miles above McMurray, and came into prominence in 1890 when, as previously stated, the Hudson's Bay Co. transferred their trading post there from McMurray. The settlement is small and the amount of trading rather limited, but at one time the district must have been good for fur trading as a number of posts were in existence in the vicinity.

Between 1820 and 1825 a post called Berens House was established on the right bank of the Athabaska, a few miles above the mouth of McKay river, and was still in existence in 1848, though it was abandoned soon after. The Northwest Co. established a post in the same vicinity and called it "Le Vieux Fort de la Rivière Rouge" but it also has been long since abandoned. Another post called Pierre au Calumet, so named because the natives produced pipestone in the vicinity, was established by the Northwest Co. about 1814, fifty miles below McMurray, and a Hudson's Bay post on the opposite bank was in existence till December, 1820, but neither of these forts was in use after the union of the two companies in 1821.

The first post established in the northern region was located on Athabaska river about forty miles above the lake. It seems never to have had a distinctive name but was called "Old Establishment" and was founded about 1778 by Peter Pond, a trader of the Northwest Co. In 1789 it was moved by Roderick McKenzie to Old Fort Point, on lake Athabaska, about eight miles west of the mouth of the river, and was renamed Chipewyan.

It was from this point that Alexander Mackenzie, in 1789, set out on his exploration of the river which bears his name.

About 1815 the site of the fort was again moved to its present location on the north shore. Its population is about twenty white people and one hundred and fifty Indians but several hundred Indians visit the post two or three times yearly to trade. The houses extend in a line along the shore for about a mile, the stockaded buildings of the Hudson's Bay Co. being at the easterly end of the settlement.

The population is supported largely by the excellent fisheries on the lake, but considerable gardening is done at the post and large crops of potatoes are raised on one of the large islands in the lake. A sawmill managed by the mission is supplied with logs from the western end of the lake and from the banks of the Roher river. Trapping is also a very important industry of the settlement.

Chipewyan is the largest settlement in the north, very pretty in summer but very dreary in winter as it gets the full sweep of the wind from the lake. Fuel is scarce and has to be hauled some distance to the settlement.

The posts at Chipewyan are built of squared logs and present a neat appearance, resembling a military barracks more than an Indian trading post. Outside the fort are a number of small log buildings occupied by employees of the company called "free men" as they have completed their term of service with the company.

The Roman Catholic Mission Board have a steamer of their own for carrying supplies to the different mission stations on account of the high freight rates charged by the forwarding companies. They also have a small printing press for printing books in the Cree language, to be used throughout the diocese.

Fond du Lac is a small settlement near the eastern end of Lake Athabaska. It is merely an outpost of Chipewyan and is not very important. About 400 Chipewyans and half-breeds live there or resort there to trade, and they are all reported to be in fair circumstances. The surrounding district is about the best in the north for wolverine, and the Indians of this post hunt in the barren land where

they trade wolverine skins with the Eskimos for other more valuable pelts. The Eskimos use wolverine fur to trim their hoods as it is the only known fur on which the human breath does not freeze.

The trading post is situated on a low point of sand and rock on the north shore and consists of a number of well-built log houses, with a yard hurrounded by a palisade of stout posts.

About the beginning of the nineteenth century the Hudson's Bay Co. established a post on the south side of the lake, which is here about two miles wide, and the Northwest Co. built one on the north shore, near the site of the present post. The three traders of the Hudson's Bay Co.'s post were murdered by the Chipewyan Indians and the Northwest traders moved to the south shore. When the Northwest Co. passed out of existence, no attempt was made to re-establish the post till 1845, when Jose Mercredi built the present post for the Hudson's Bay Co.

Fond du lac is on one of the principal lines of travel of the barren ground caribou in their regular migrations north and south. The settlement at the head of the rapids on Slave river is called Fitzgerald after Inspector Fitzgerald of the Royal North West Mounted Police who, with his party, perished on a patrol from McPherson to Dawson in 1911. The former name was Smith Landing, as it was at this point that all trade for the north was landed to be portaged to Fort Smith, sixteen miles farther north, at the foot of the rapids. It is an unimportant post and owes its existence to the fact that it is at the head of the rapids which form the only obstacle to navigation between McMurray and the Arctic ocean.

Fort Smith, named after the late Lord Strathcona, was established as a Hudson's Bay post in 1874. The warehouses of the traders stand on the shore of a deep bay which has been carved out by the eddy from the lower part of the rapids. The steamers of the lower Slave and Mackenzie discharge their outgoing cargoes and take on supplies for the far north at this point.

Fort Smith will no doubt become of some importance soon, as the office of the mining recorder for the Northwest Territories, which was formerly located at Edmonton, has recently been moved there, and this will likely form the nucleus for other administrative offices.

The amount of trading done at this post is rather limited, as the settlers consist of employees of the trading companies and the men engaged in portaging, about fifty people, all told.

Resolution is situated on the southern shore of Great Slave lake, near the mouth of Slave river, and is one hundred and ninety-four miles from Fort Smith. The name of the post is suggestive of the hardships encountered in establishing it.

In 1785 the Northwest Co. erected some trading houses a few miles east of the mouth of Slave river and a few years later built a regular trading post on Moose Deer (Mission) island, about half a mile west of the present location of the post. The Hudson's Bay Co. also built a post on this island, which at that time was their farthest north. After the union of the two companies in 1821, both these posts were abandoned and Resolution was built on its present site the following year.

Resolution is a very important trading post as it is from there a start is made for the barren lands to hunt the musk ox, and nearly all the robes are marketed there. Other fur is also plentiful and trading houses have been established by several fur companies.

The settlement consists of the houses of the traders, a large convent, mission, school, and church, and a number of log-houses of half-breeds and Indians and the employees of the different trading companies, the total population being about 700.

The only post on the north shore of Great Slave lake, Fort Rae, is located on the extremity of a projecting point, formerly an island, but now connected by a marsh with the eastern shore of the north arm of the lake. It was established in 1852 mainly as a provision post and was named after Dr. John Rae, who secured the only information regarding the fate of the Franklin expedition of 1845.

The settlement consists of about twenty houses and two trading posts. The population is made up principally of Indians who depend for their sustenance mainly on the visits of the caribou, which pass twice every year. The distance from Providence to Fort Rae, either across the ice or along the shore, is about 150 miles.

A short distance south from the fort, on the shore of a little cove called Sandy bay, a few crumbling ruins of clay and stone chimneys mark the site of an old fort abandoned so long ago that nothing was known concerning it by the oldest inhabitants of twenty years ago. This was probably an old post of the Northwest Co. A reference is made to a post in this locality in a letter written from "Mountain Island, Great Slave lake," in 1820, by W. F. Wentzel to Roderick McKenzie, who intended publishing a history of the Northwest Co. Owing to the union of the two companies in 1821, this history was never published, and much of the information collected for that purpose was destroyed or lost.

A ruin is all that is left of old Fort Reliance which was situated at the mouth of Lockhart river at the eastern end of Great Slave lake, and occupied one of the most beautiful sites in the north. A green terrace twenty feet above the lake forms the spot on which Sir George Back in 1833-35 erected three substantial buildings which formed his winter quarters during his exploration of the surrounding district. Only five stone chimneys now remain and the bare outlines of these buildings can scarcely be distinguished on the ground. Back from the site of the fort other terraces rise for a considerable distance. A striking feature of the place is the number of well beaten roadways leading nowhere, covered with the innumerable tracks of the caribou, occasionally followed by those of a prowling wolf.

The trading post of Hay River is situated at the mouth of a stream of the same name, which flows into Great Slave lake about seventy miles southwesterly from Resolution. The population is about 150 and the amount of trading done is comparatively small. In the upper reaches of the river, beaver are trapped and the Indians trade the skins at this post. The land around the post is low and marshy and grassy plains border many of the small streams.

The river enters the lake by a number of mouths and is not over three or four feet deep on the bars. Light draft steamers could ascend the river to the foot of the falls, about sixty miles distant.

Old Fort Providence was located on the north arm of Great Slave lake, at the mouth of Yellowmouth river. It was a Northwest Co. post, established over 100 years ago, but it was abandoned soon after the union in 1821.

The present site of Providence is near the western end of Great Slave lake, about forty miles west of Big island. Settlement was begun there in 1862 and the trading post established six years later. An old trading post was established by the Northwest Co., a little farther down the river, in 1796, but the trader was murdered by the Eskimos three years later and the post was abandoned.

The population of the present post is about four hundred and the excellence of Big Island fishery close by furnishes employment to a great many of the Indians and half-breeds. This industry will likely be further developed, owing to the post lying on the direct line of travel to the Mackenzie oil fields, and also because the supply of fish in Great Slave lake appears almost inexhaustible.

## EDUCATION

No organized system has yet been provided for promoting education in the northern settlements and the only institutions for that purpose are those established and maintained by the missions of the Roman Catholic and Anglican churches. The Roman Catholic schools are conducted by the Grey Nuns and lay brothers, while the Church of England schools are in charge of the officiating clergyman and his assistants

at each post. The expenses of maintenance in both cases are met by private contributions from the older settled parts of Canada, supplemented by a very small government grant.

The Mission schools are spacious buildings providing accommodation for about 100 pupils at the larger posts. The half-breed and Indian children live at the mission while their parents are engaged hunting or fishing and only in rare cases do the parents bear the expense incurred on behalf of their children. The interest and self-sacrifice on the part of the missionaries and teachers and their untiring efforts in the face of numerous difficulties, never experienced in settled districts, are worthy of commendation.

Invariably the dormitories and schools are models of neatness and would put to shame many of the similar institutions in the more settled parts of Canada.

In the Roman Catholic missions the class teaching, sewing, cooking, etc., are supervised by the nuns, while the lay brothers cultivate the mission farms and teach the boys agriculture, carpentry, boat building, etc. They also, with the help of the older boys, provide fuel and other local necessities for the mission.

As soon as the children attain an age where they can be of assistance to their parents they are taken from the schools and soon drift back to their ancestors' mode of living. Higher education for the Indian or half-breed children is practically unknown and, even were they willing to remain and study, the missions have not the facilities and accommodation available, as they are taxed to capacity caring for the smaller children.

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